TECHNOLOGY DEPT.

Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
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AMERICAN
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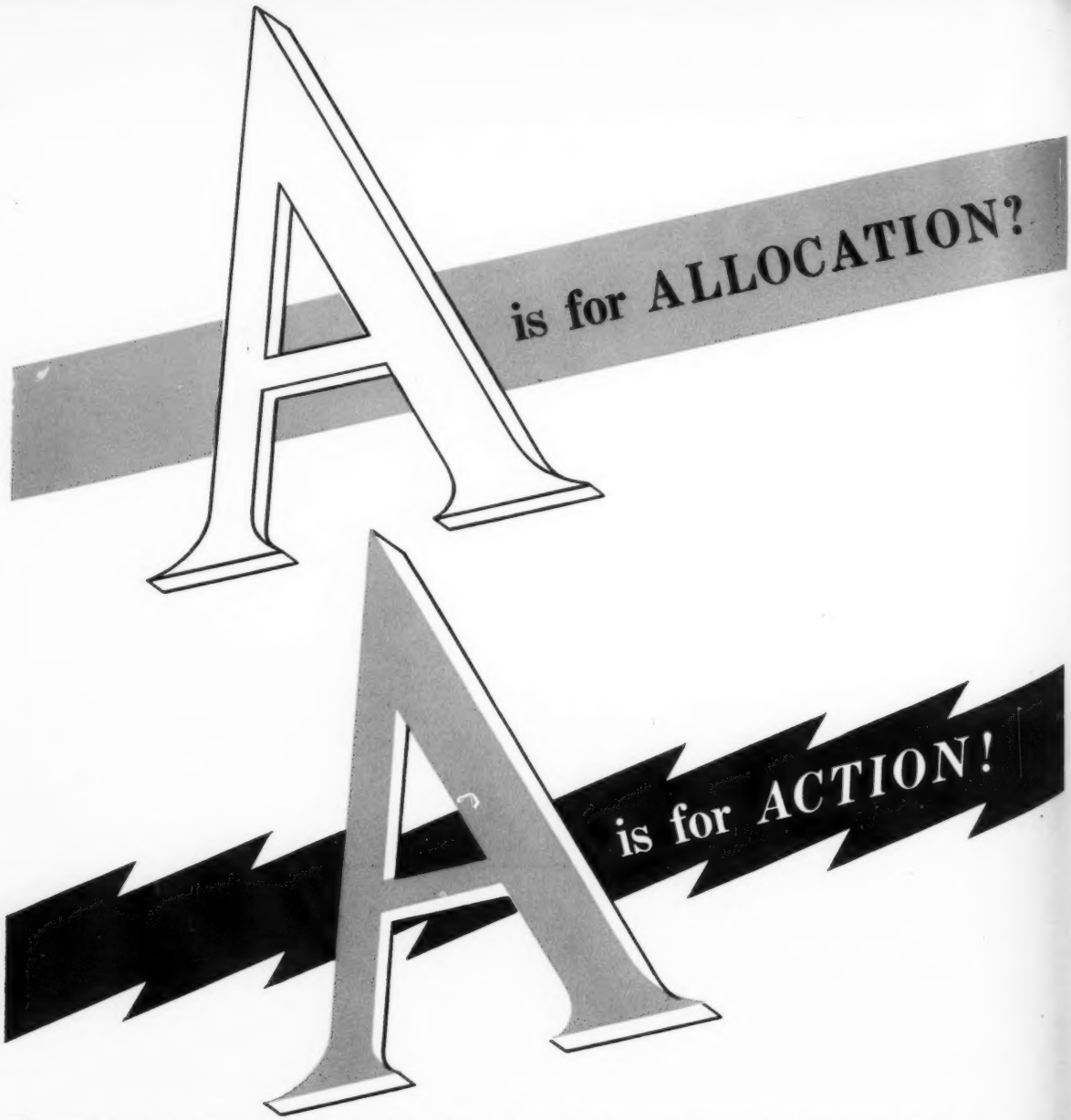

"Essential to the war effort" must continue to guard the reserves and allocate the flow of many chemical supplies.

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*Reg. U. S. Pat. Off

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5. It is an effective stabilizer for oil in water emulsions.
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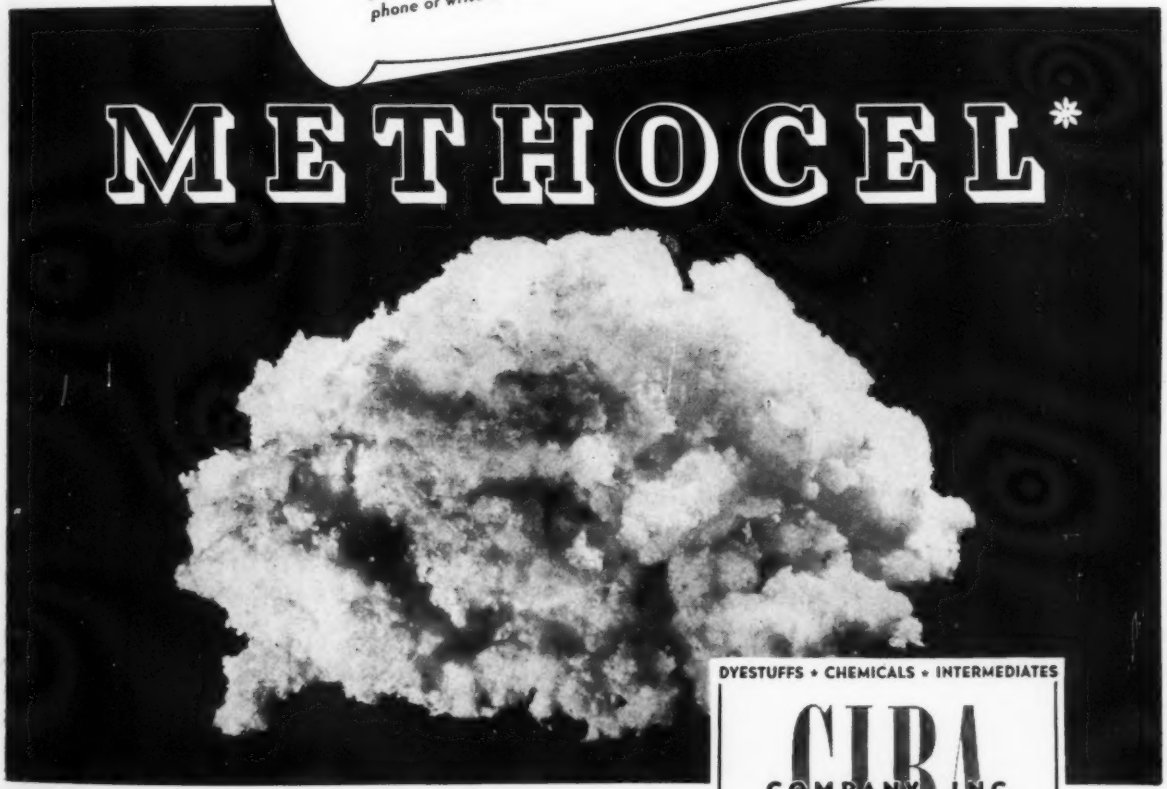

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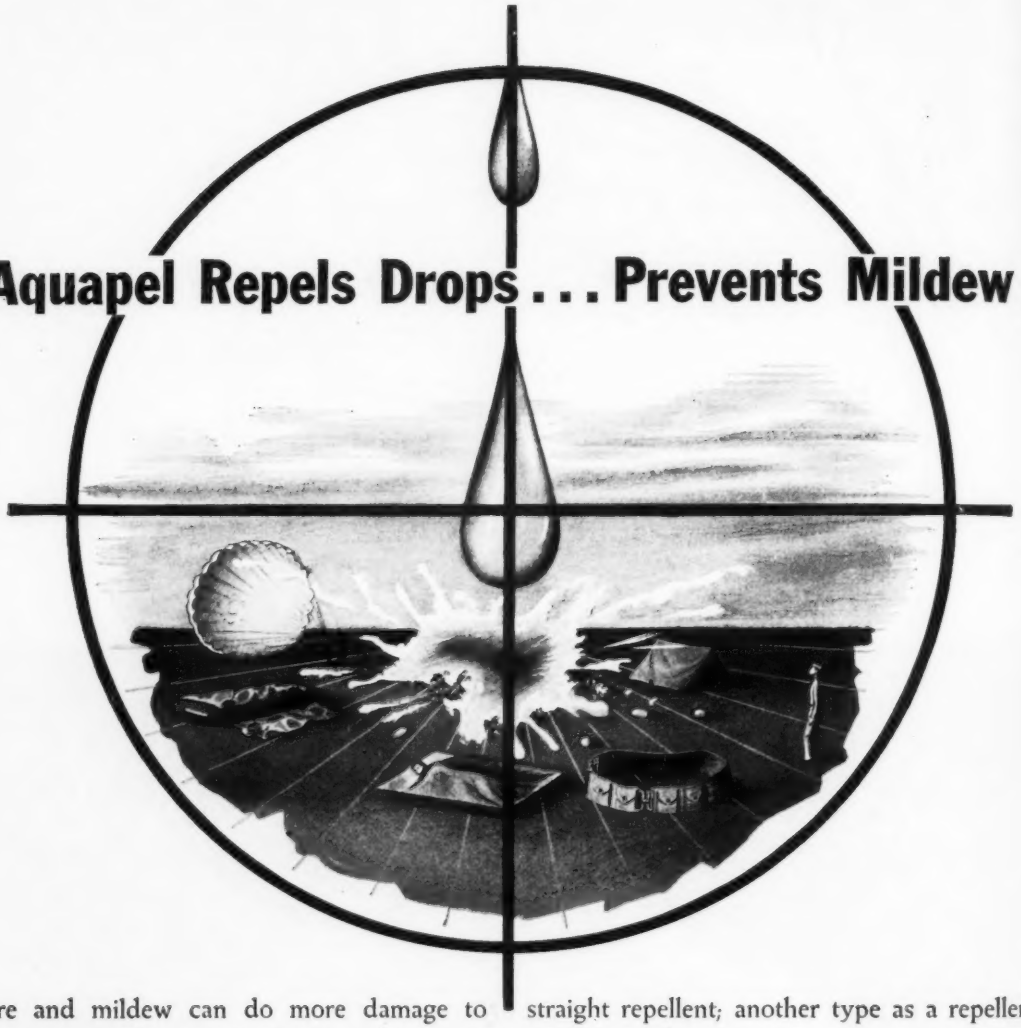

Moisture and mildew can do more damage to military materials than bombs for they never miss their target. Stopping moisture-mildew menace to hundreds of war-useful materials is the job of the Aquapel group of Fanco products.

There is a type of Aquapel suited to every fabric and need. Aquapel can be applied in a single bath operation. One type Aquapel can be used as a straight repellent; another type as a repellent and mildew preventative.

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Shroud Lines Need Aquapel
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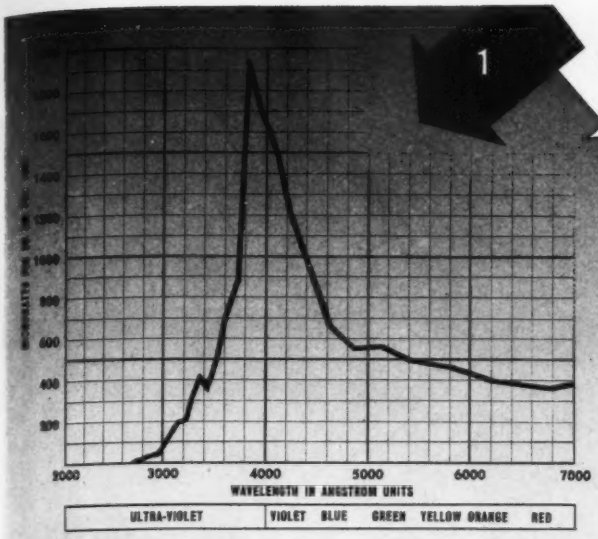

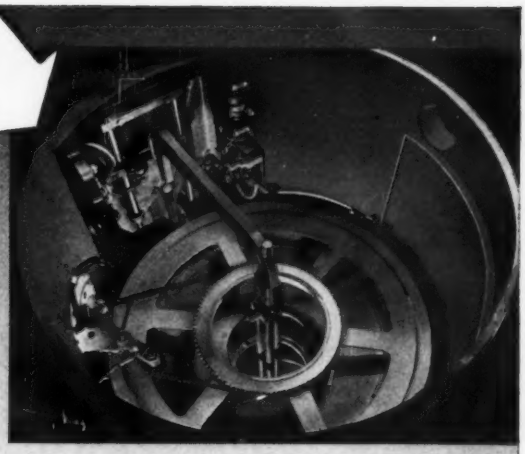

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The National Type XV Unit is in Demand for Accelerated Fading of Dyed Fabrics . . .

TRADE-MARK

1 TYPE OF LIGHT SOURCE. This accelerated fading machine utilizes the flame type carbon arc burning "National" *Sunshine* carbons. This arc provides radiation recognized as the closest approach to the full spectrum of natural sunlight available from any light source of suitable intensity. The spectral energy distribution curve above shows the similarity of radiation from this arc to natural sunlight, especially in those regions of the spectrum most important in the fading of colored materials.

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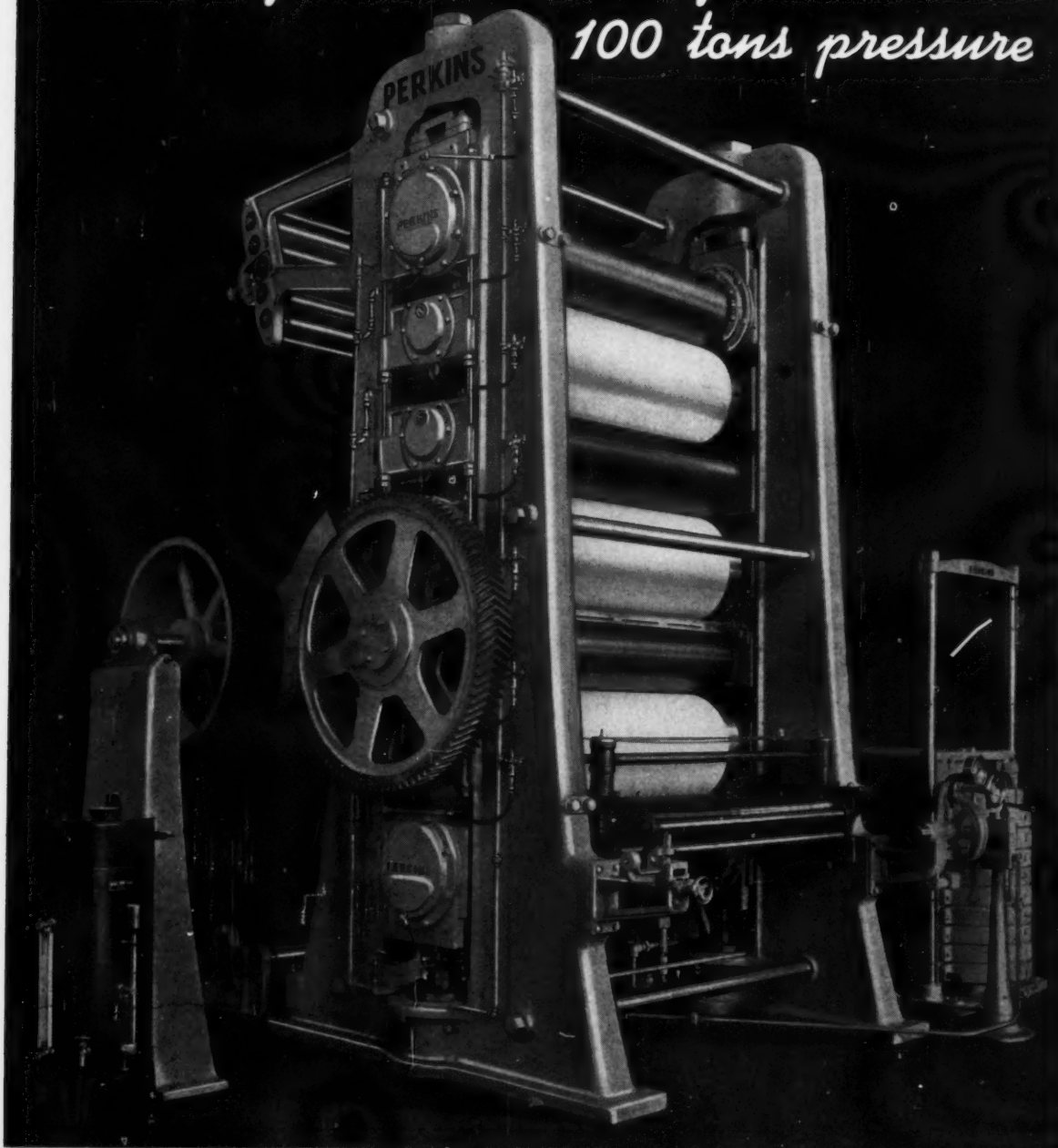

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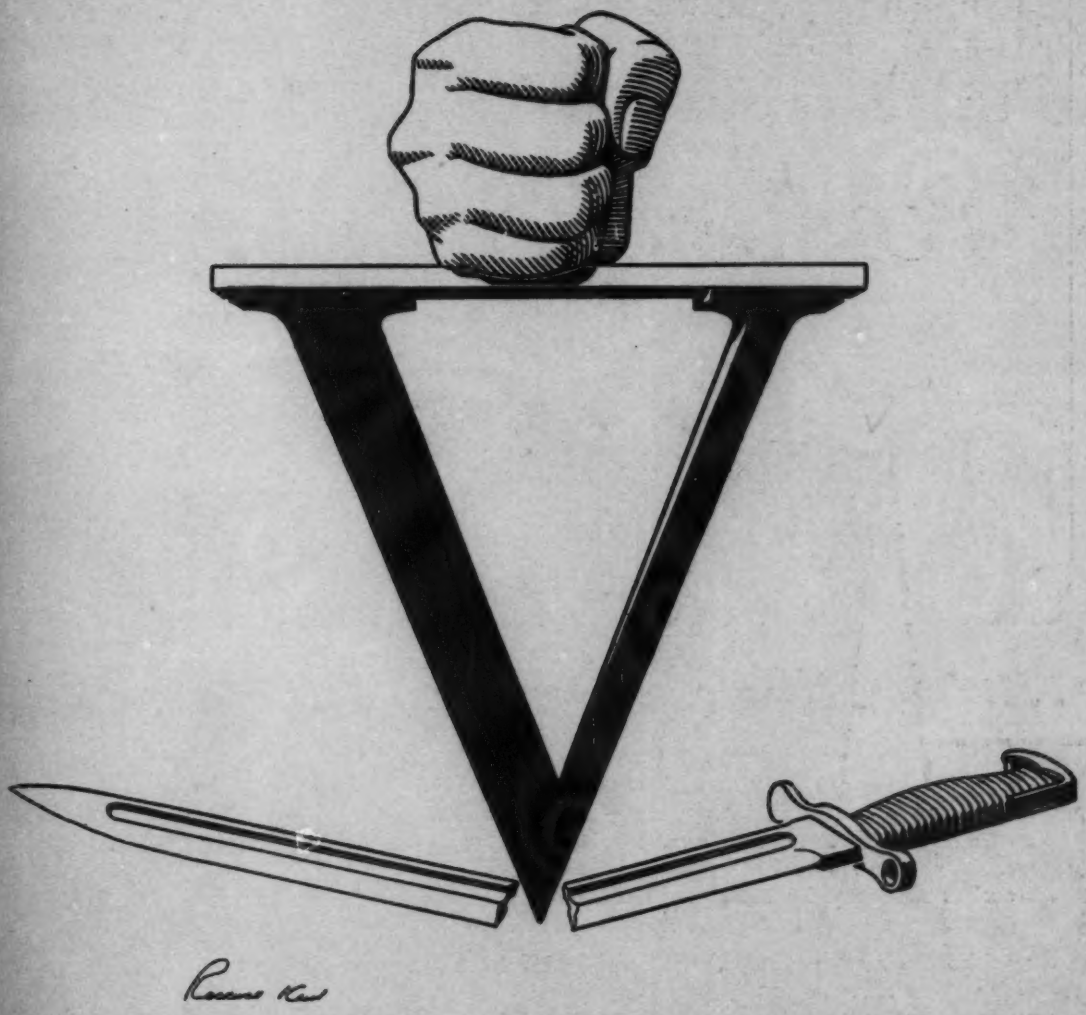

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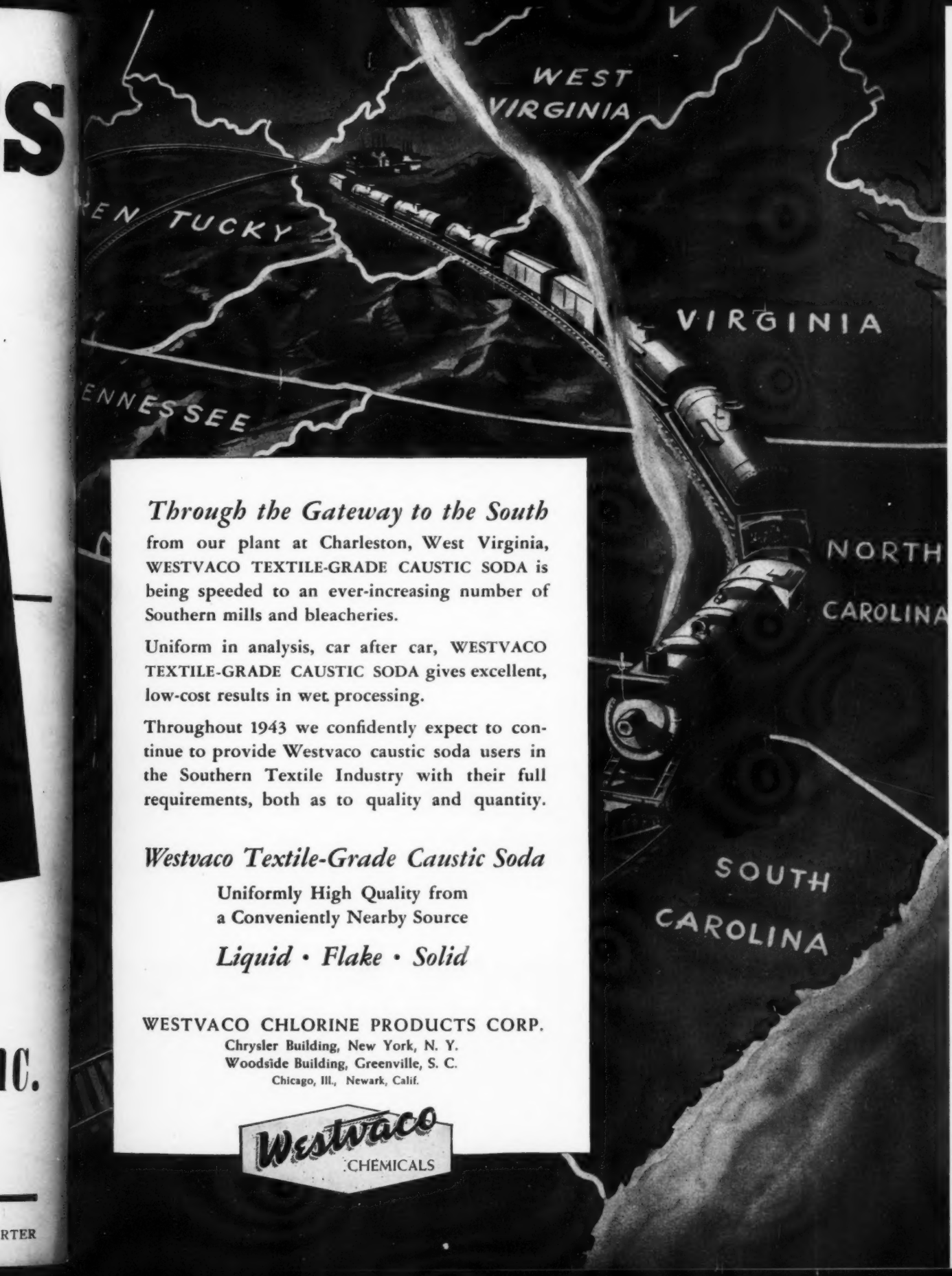

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An AHCO PRODUCT

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2. Improves water fastness of finished fabrics.
3. Minimizes need of subsequent finishing operations, due to softening effect.
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5. Resistant to hard water, acids and normal salt concentrations.
6. Easily applied and economical to use.
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Chemical	Formula	Molecular Weight	Boiling Point °C. at 760 mm.	Vapor Pressure in mm. Hg. at 20°C.
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Polyethylene Glycol 200	$HO(CH_2CH_2O)_xH$	200 avg.	—	<0.01
Polyethylene Glycol 300	$HO(CH_2CH_2O)_xH$	300 avg.	—	<0.01
Polyethylene Glycol 400	$HO(CH_2CH_2O)_xH$	400 avg.	—	<0.01
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Eastone Yellow 6GN* is one of the cleanest and brightest shades of any of the acetate dyestuffs. It is of particular value in producing chartreuse and other green dyeings having a maximum brightness. Eastone Yellow 6GN has high resistance to gas fading, and it is recommended for use in combination with Eastone Blue BB to produce greens of equal fastness.

Eastone Yellow 6GN is produced as a highly dispersed powder and has very good affinity and level dyeing properties at both high and low temperatures. It is well suited for all types of acetate rayon fabrics in either jig or box dyeing.

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EASTMAN ACETATE DYESTUFFS

**"Eastone" is a registered trade mark and denotes a type of dye which is dischargeable, as well as usable for plain dyeing.*

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Today's tight production schedules leave no room for processing mistakes. And that's one big reason why alert textile men are taking advantage of the safe, efficient processing result, obtainable with Olate.

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Suds are not guns. They don't shoot. But they can be mighty important as a morale builder.

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You can do the job faster and cleaner by using de-sizing compounds made with YARMOR 302-W.

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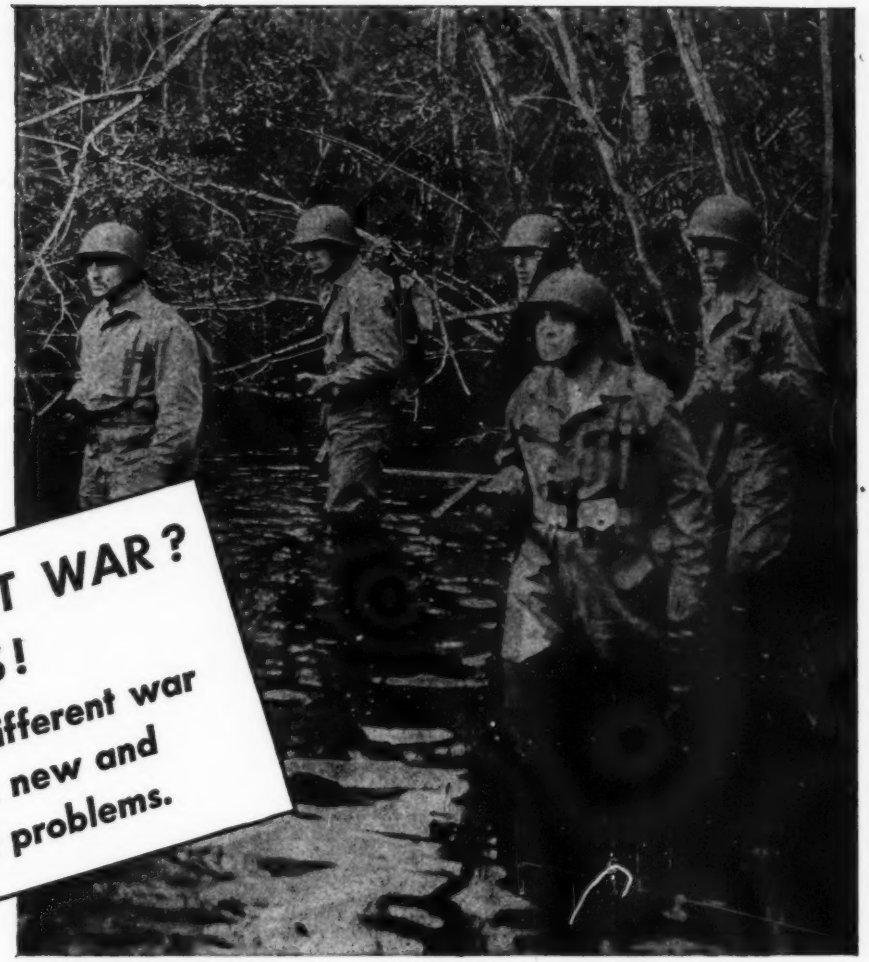

Uncle Sam's fighting men in the jungle, in the Arctic, on the desert - - all over the world - - are demanding fabrics finished to meet the extreme conditions of this new kind of war. ● Arkansas' vast peacetime experience is now solving wartime problems . . producing for textile processing and finishing plants products that meet exacting government specifications.

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*REG. U.S. PAT. OFF.

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INDIGOSOL Grey IBL produces clear, bluish-tone Greys of very good fastness for printing, dyeing and padding. It can be shaded with any of the Indigosol Yellows, Orange or Browns to obtain any of the shades of Grey desired.

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APRIL 12, 1943

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A Comparison of Methods for the Determination of Water Absorbency by Terry Towels

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Cannon Mills Co.

INTRODUCTION

THE textile industry is greatly in need of a standard method for quickly and accurately determining the absorbent qualities of not only terry towels, but all types of toweling in general. Today, there is no recognized standard, no two mills use the method, or if they do, their techniques are entirely different. The general practice has been for each mill to develop its own procedure which, with few exceptions, are very crude and yield no consistent comparative or relative figures. Therefore, the outstanding need is for a standard procedure for measuring towel absorbency of water which will yield results that may be easily interpreted as a function of the qualities of the towel.

The closest approach to what may be termed a standard is that specified for crash towels in Federal Standard Stock Catalogue No. DDD-T-511, Jan. 1934, F-3a which is a wick-up method and requires a minimum water rise of 6 cm. in 5 minutes. Recently, Larose (Am. Dyestuff Reporter 1942, 31, No. 5, pp. 105-108, 123-124) proposed a method in which terry samples were placed on wet porous plates under a definite pressure for measured periods of time. The values were reported as take up of grams of water per gram of sample.

The test most generally found in towel mills for quick routine checking of absorbency is commonly referred to as the "drop square test." This consists of dropping a square of material on the surface of a beaker of water and noting time required for the square to take up water and sink.

The purpose herein is to compare the most commonly used test found in mills today, the Larose method and the method which has been employed by the laboratory of the writer for the past three years.

PROCEDURE

In the daily routine of checking the absorbency of finished terry towels, each sample was tested by three methods. The samples were conditioned for 3 hours at 65 per cent R.H. and 70° Fahrenheit and the tests conducted under the same conditions.

The three methods were as follows:

1. The "Drop-Square Test"

2x2 inch squares of the sample were conditioned for 3 hours under the standard conditions above. The squares were dropped on the surface of beaker of water and the time elapse between contact with the water and when the square starts to sink after becoming saturated is accurately recorded. These samples were run in triplicate. See Plate No. 1.

2. The "Larose Method"

This procedure was carried out exactly as stipulated by Larose: a specimen 2 inches square was cut from the towel to be tested and weighed. The specimen was then placed on the wet alundum plates and immediately covered with a glass plate weighing 35 grams and of sufficient area to amply cover it. After an interval of time, the specimen and glass plate were transferred to a tared watch glass with the glass plate covering the watch glass so as to prevent loss of moisture, and the whole weighed. Standard conditions of 65 per cent R.H. and 70° F. are necessary for accurate results. The results are expressed as grams of water absorbed per gram of towel. See plate No. 2 for a description of the apparatus. For further details see Larose (Ibid., *31*, No. 5, 105-108).

3. The "Wick-Up Method"

This method has been employed by the laboratory of the writer for the past three years and has been very satisfactory. It is a modification of the government method for huck and crash towels, Federal Standard Stock Catalogue No. DDD-T-511, Jan. 1934, F-3a. The modified procedure is as follows: strips of terry are cut 7/8"x6" and conditioned at least 3 hours at 65 per cent R.H. and 70° F. On running the wick-up, a small wire hook, carrying a 2 gm. weight, is attached to the lower end, and the strip is suspended with 1 inch of the lower end below the surface of a 0.005 per cent water solution of Pontacyl Rubine R Conc. The height of rise is noted at 15, 60, 90 and 120 second intervals by means of a suitable rule mounted alongside the terry strip. Results are noted in inches rise per time interval. Excellent checks are obtained with ease. See plate No. 3.

APPARATUS FOR DETERMINING ABSORBENCY OF WATER BY TERRY TOWELS

Plate 1
Drop-Square Test

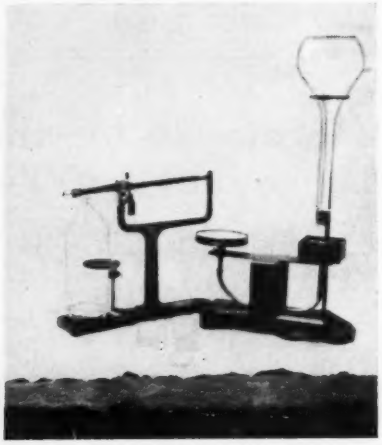

Plate 2
Larose Method

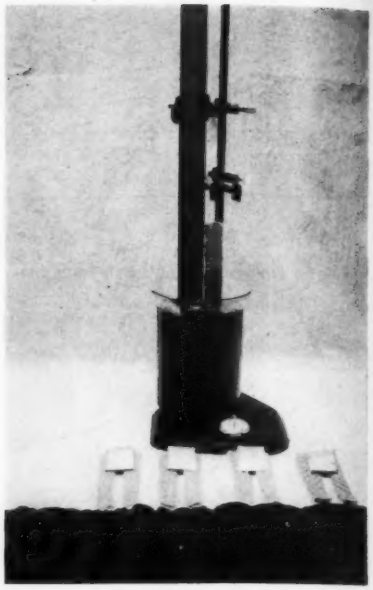

Plate 3
Wick-up Method

RESULTS

Table I illustrates the comparative results obtained by means of the three methods in routine testing on colored toweling from a typical day's production. The Wick-up column represents capillary rise in inches at the end of 2 minutes; the Larose column indicates grams of water absorbed per gram of towel in 1 minute; and the Drop-Square column, seconds required for sample to sink after being placed on surface of water.

The data in the table was selected at random from the 200 samples run and the results are representative. The reason for giving the two minute reading in the Wick-up results, and not the 15 second or 1 minute reading, is that this laboratory has established a Wick-up of 1.90 to 2.00 inches in two minutes as being a standard for good absorbency in terry toweling. The one minute reading was selected for the Larose Method for convenience and range of results.

Figures 1, 2 and 3 serve to illustrate and compare the characteristic curves obtained with the Wick-up and Larose methods when terry toweling absorbency is checked by them over an extended period of time. It is co-incidental that although these two methods measure absorbency by means of diverse units, the limits of range is about the same in both. The sharpness of break of the Larose curves is quite noticeable when compared with the more gradual lag of the Wick-up curves. As shown by the curves, this break generally occurs around a three minute time interval.

DISCUSSION OF RESULTS

Where the terry towel has a uniform pile, consistent checks may be obtained by all three methods. Differences occur when terry towels having woven figured designs are tested. This means that some areas of the towel are free of

TABLE I

Sample	*Style*	*Drop-Square*	*Larose*	*Wick-up*
1	No. 9777 Rose	0.75	2.12	2.13
1	" 9777 Rose	0.75	1.70	2.19
2	" 9760 Peach	1.0	1.35	2.00
2	" 9760 Peach	1.0	1.35	2.25
3	" 9760 Peach	0.75	1.60	2.31
3	" 9760 Peach	0.50	1.44	2.25
4	" 9760 Rose	0.50	1.65	2.31
4	" 9760 Rose	0.50	1.63	2.31
5	" 9760 Green	0.75	2.00	2.31
5	" 9760 Green	0.50	1.54	2.31
6	" 9653 Turq.	0.50	2.50	2.13
6	" 9653 Turq.	0.50	2.39	2.13
7	" 9653 Blue	0.75	2.18	2.13
7	" 9653 Blue	0.75	2.25	2.13
8	" 9791 Blue	1.75	1.25	1.88
8	" 9791 Blue	1.75	1.78	1.81
9	" 9762 Rose	62.0	0.04	0.38
9	" 9762 Rose	72.0	0.20	0.44
10	" 9641 Yellow	1.75	2.15	2.00
10	" 9641 Yellow	1.00	2.08	2.06
11	" 9641 Green	7.0	1.10	1.06
11	" 9641 Green	9.0	1.14	1.13
12	" 9732 Green	1.25	1.21	2.00
12	" 9732 Green	1.75	1.11	2.00
13	" 9732 Maize	1.0	1.06	2.25
13	" 9732 Maize	1.0	1.10	2.25
14	" 9768 Green	0.50	1.82	2.25
14	" 9768 Green	0.72	1.82	2.31
15	" 9768 Yellow	2.75	1.96	1.56
15	" 9768 Yellow	3.75	1.91	1.63
16	" 9766 Rose	1.0	1.54	1.94
16	" 9766 Rose	1.0	1.36	1.94
17	" 9733 Yellow	1.00	1.06	2.13
17	" 9733 Yellow	0.75	0.95	2.19
18	" 9733 Rose	0.75	1.83	2.25
18	" 9733 Rose	0.75	1.66	2.19
19	" 9733 Peach	0.75	1.42	2.19
19	" 9733 Peach	0.75	1.43	2.19
20	" 361 White	1.25	1.52	2.56
20	" 361 White	1.25	1.55	2.56
21	" 362 White	1.50	1.82	2.19
21	" 362 White	2.00	1.76	2.25

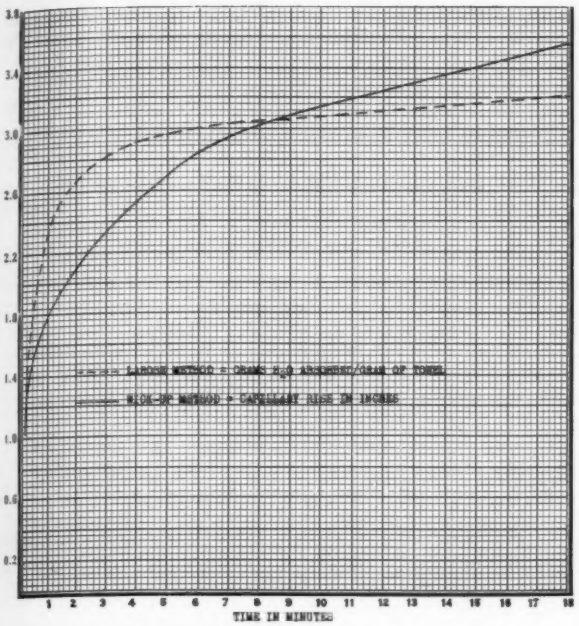

Fig. 1—Absorbency of Yellow Terry Towel

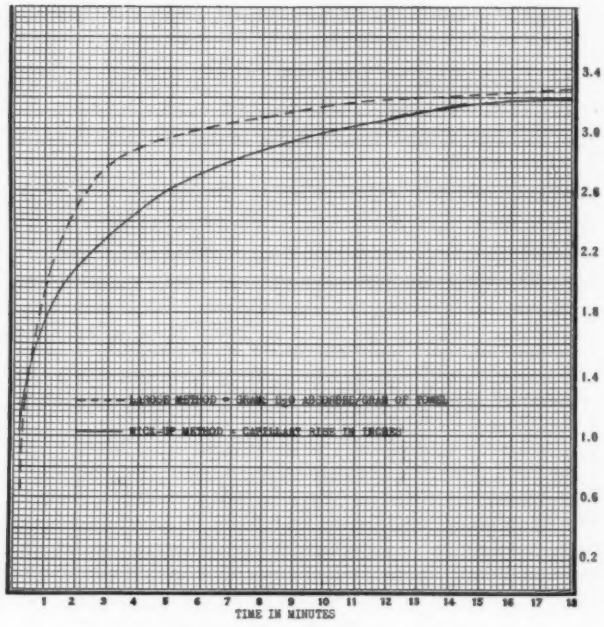

Fig. 2—Absorbency of Peach Terry Towel

pile and, in the case of the Larose procedure, less surface is contacted, and consequently less water is absorbed in the measured interval of time. Such a condition has no appreciable effect on results obtained by the Wick-up method. The Drop-Square results are effected as with the Larose, but the differences are considerably smaller. The differences here would obviously be small when the speed at which the square takes up the water is taken into account.

In Figs. 1, 2, and 3 it is shown that the Larose and Wick-up Methods yield consistently characteristic curves. The curves for the Larose Method break comparatively sharply whereas, those of the Wick-up procedure are long and flat,— more nearly approaching a straight line. The fact that these curves are characteristic is a definite aid in setting up a value for good or poor absorbency. As Larose brought out, that a towel is useless for drying purposes after it has absorbed 150 per cent of its weight of water, there is no need to take measurements, in the case of either method, beyond a time interval of one or two minutes.

In addition to accurate, interpretable results, it is essential that a standard procedure for measuring the water absorbency of towels be characterized by simplicity and as little manipulation as possible. In most mills concerned with this testing, the operators carrying out the routine work are seldom technically trained and do not realize the importance of controlled conditions. It is true that all three tested methods are relatively very simple when compared to ordinary chemical analysis, yet a method cannot be too simple to eliminate errors of the human element.

Unquestionably, the Drop-Square test is the simplest to carry out. It requires a minimum of apparatus and the least manipulation. The Wick-up Method likewise, requires no special apparatus and is only slightly more difficult in manipulation. The Larose Method uses more special apparatus, but this may easily be constructed by any tin shop, and more manipulation is needed than with the previously mentioned methods.

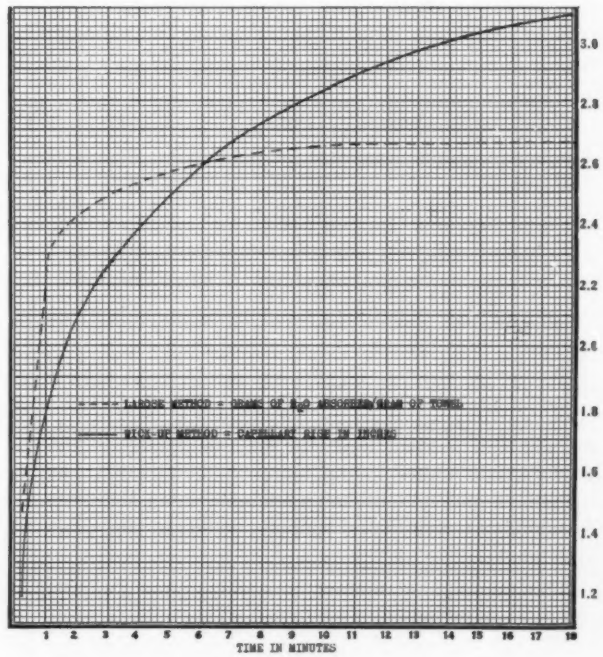

Fig. 3—Absorbency of White Terry Toweling

It must be brought out that for accurate, day to day routine absorbency testing, the atmospheric conditions must be reasonably close to a set temperature and humidity all

the time. For comparative, hurried checks, this is not necessary.

CONCLUSIONS

Both the Wick-up and Larose Methods may serve as standard procedure for measuring the water absorbent qualities of terry towels. The Wick-up is somewhat simpler and faster due to less manipulation, but the Larose Method has an advantage in that it applies pressure in simulating ordinary usage. In order that consistent results be obtained, both should be carried out under standard conditions and a fair degree of skill.

The Drop-Square Method is not suitable for a standard procedure since its units of measurement is limited, varying weights in towels would make it difficult to set up a standard for all towels, entrapped air would introduce further errors, and no two squares are dropped alike by the same operator. However, this test is admirably suited for comparative routine quick-testing at the mill production line.

The writer has attempted to present three methods for determining, in some measure, the water absorbent qualities of terry towels with comparative figures in order that the reader may evaluate for himself the merits of all methods. Undoubtedly, one method may suit the conditions and needs of a particular mill more than others. One fact still remains, and that is the definite need for a recognized standard procedure for measuring the water absorbent qualities of towels.

Acknowledgment is to be made to Miss Alice Petrea and Mrs. Virginia Rodgers who conducted most of the tests in this paper.

HOW TO MAKE PIPING NOISELESS

W. F. SCHAPHORST

HEAD-SPLITTING noises are often transmitted through metal piping—water hammer noises, mechanics' blows, vibration noises, hissing sounds, etc.—and yet but little is ever done about it except once in a while, to cover the piping. That "helps," true enough, but the noises are merely "wrapped up"—not eliminated. Metals and liquids are better transmitters of sounds than are air and other gases.

This question therefore naturally suggests itself: "Why not stop metal pipe noises by inserting isolated joints at occasional intervals?" It can be done by following the same method that is so successfully employed in isolating machinery vibration. This writer recently put the question to concerns who are in the vibration isolation business and he received favorable replies. It was suggested that screwed flanges of ample dimensions be used with broad and thick cork gaskets. Cork is an excellent material for vibration isolation. The bolts, too, should be cork isolated at each end and should be completely surrounded by isolating material so that there will be no metal-to-metal contact in the joint whatever. Such a joint should prove to be leakless under high pressures and temperatures, and it should effectively stop sound waves through the metal piping. Canvas and rubber joints are now successfully used on low pressure ventilating ducts for eliminating metal duct noises. The above method would eliminate noises from high pressure piping, so why not do it? It is entirely feasible and "vibration experts" agree with the writer.

Joints of this type will doubtless make their appearance presently.

HOW TO FIGURE FUEL SAVING

W. F. SCHAPHORST

MANY users of fuel, eager to save fuel as well as money, are asking this question: "After installing a fuel saving device which has reduced the temperature of our chimney gas, how can we now correctly compute the fuel saving?"

This is the way: How many degrees F. has the temperature of your chimney gas been reduced? Multiply that reduction in deg. F. by the number of pounds of gas per pound of fuel. Multiply that by 24. Then divide by the heat value of the fuel in Btu. per pound. The result is the saving in per cent. For example if the temperature of your chimney gas was 650, and it is now 500, the reduction is 150 deg. F. If there are 19 pounds of gas per pound of fuel, and the fuel contains 14,000 Btu. per pound, apply the above rule and you will find the saving to be 4.9 per cent. Or, more roughly, if you don't know all of these things, simply divide the reduction by 30. Thus 150 divided by 30 equals 5 per cent.

NO BELT "PULLS LIKE A CHAIN"

W. F. SCHAPHORST

EVERY once in a while we read impossible claims concerning various belts which are doubtless based on enthusiasm rather than on facts. For instance I have heard many a salesman say, "My belt pulls like a chain."

There is no belt in the world that pulls like a chain and there never will be. The only way in which a belt can be made to pull like a chain is to put teeth in it, but as soon as teeth are put in a belt it is no longer a belt. It then becomes a "toothed drive."

This applies to all belts regardless of material—leather, rubber, cotton, balata, and even steel.

All belts slip, or creep, regardless of material. Chains neither slip nor creep. Creep in a belt is unavoidable because all belts are elastic. Creep is an elastic property and can be computed in advance with positive precision.

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Processing of SYNTHETIC TEXTILE FABRICS*

CLARK HEYDON
United Piece Dye Works

WHEN I was asked to take part in this discussion on the dyeing and finishing of synthetic fibers I felt that anything I could say from the technical side to the members of the New York section would be very much like "carrying coals to Newcastle." I do believe, however, that this is probably a very good time to review practical work to which we have all contributed, as it seems to me that the post-war period will bring us new problems which at the moment are difficult to anticipate. This does not mean that the work on which we have been and are still currently engaged will not be important after the war. It will be, but it will be supplemented by newer synthetic fibers, new processes for handling these fibers and new synthetic products to facilitate these processes. Up to the moment we have had relatively little experience in the behavior of these fibers and products in practical dyeing processes.

The development of synthetic fibers in dress goods construction of the present time can be considered as being similar to the situation which existed at the end of the last world war. While several types of "artificial silk" were known at that time, the only ones which continue to have importance today are the regenerated celluloses, viscose and Bemberg and acetylated cellulose popularly known as acetate. Already during the present war we have become very familiar with at least three new synthetic fibers—nylon, Aralac and Vinyon. While one does not necessarily like to correlate scientific achievement with world catastrophe, it does seem more or less natural to divide my remarks into two phases:

1. Processing, in retrospect, of viscose and acetate fabrics during the post World War I period and
2. The prospect of developments following the present war insofar as it is possible to view them at the moment.

As for the past, the only important continuous filament fiber of other than synthetic origin was silk, long regarded as the aristocrat of textiles. Its beauty, strength and value as a textile fiber need no comment from me other than to say that it holds a very soft spot in my own heart. I entered the textile field when silk was at its height of popularity and witnessed, very closely, its retrogression. In fact my contribution to its downfall consists of having weighted many million yards of silk fabrics.

*Presented at meeting, New York Section, March 5, 1943.

It is not difficult to understand that the first attempts to produce synthetic fibers were based on emulating nature's process of spinning continuous filaments as practiced by the silk worm. It was also easiest to use these fibers in continuous filament form, so that the first fabrics woven from synthetic yarns used these yarns in filament form. It is only comparatively recently that we have been processing fabrics woven from synthetic yarns which have been cut into staple lengths and spun. It is readily understood that yarns spun from cut staple offer much more variety and novelty in fabric construction than is obtainable from filament yarn.

Improvements in tensile strength and appearance of the older fibers as well as added experience in fabric construction have brought them to a very high state of development.

Concerning future developments, it is not my intention to put myself in the position of a prophet as I briefly discuss the possibilities of the future. It is, however, something we should be thinking about continually. We should take every opportunity of experimenting with the newer fibers or combinations of them whenever they present themselves, even if only in limited amounts. In this way we can determine their characteristics, both physical and chemical and thereby better visualize their possible uses in textile materials.

I believe it will generally be agreed that nylon is the outstanding contribution of science to the synthetic yarn field of the past few years. The fact that its tensile strength and elasticity are at least equal to that of natural silk and that this strength is maintained when completely wet, places nylon in a class by itself when compared to other synthetic yarns.

You all know that nylon had created quite a reputation for itself as a substitute for silk hosiery yarn even prior to its currently more important use for parachute cloth. The almost overnight transfer from a knitting yarn to a weaving yarn has brought nylon more rapidly to the front, as far as piece goods finishing is concerned, than would normally have been the case. When the war is over and civilians are asked to absorb the output of plants geared up to war production we must, without doubt, expect to see nylon in fabric construction in ever increasing variety. It stands to reason that the manufacturers of the product will be seeking new outlets for it. It will be necessary to have

available the necessary information for processing these fabrics as they appear. Already several contributions have been made to this Association on subjects in this direction but I feel sure that the authors themselves would be the first to admit that the information developed so far has only scratched the surface. Some of the physical characteristics of nylon are entirely different from our present conception of textiles. It is highly thermoplastic and consequently more permanently reactive to heat than other textiles. Its elasticity characteristics must change our ideas on the use of the tenter frame for width control, such as we use on fabrics of the older synthetic yarns. The necessity of some kind of "presetting" operation to reduce shifting of warp and filling and prevent excessive creasing is a problem which has not been finally solved as far as fabric processing is concerned.

It is reasonable to expect that combinations of nylon and other fibers will come to us for dyeing and finishing. These new fabrics will most likely be in the high price field and experimentation will be expensive but we would be foolish to assume that they will be easy to process. I feel, personally, that this is the time to give some thought to these new problems which actually are not very far away.

The same remarks apply also to such new fibers as Aralac, Vinyon and others. Many of us have already come into contact with considerable quantities of these fibers in our daily work. No one can say at this time how important they are going to be in the future. Who would have dared prophesy in 1918 that the production of viscose rayon in 1941 would have reached the total of 471,000,000 lbs. in the United States alone, or that Acetate would have achieved a corresponding total of 133,000,000 lbs. These figures are the best indication I can give you of the importance of trying to keep pace with the developments of synthetic fibers in our practical processes of dyeing and finishing them.

In view of fabric types which will probably develop in the future it might be of interest to review very briefly the history of rayon fabric development during the past twenty-five years.

In filament yarn fabrics, the first all rayon ones were fabrics such as crepes, satins, taffetas, etc. woven from bright yarn and later from a delustered yarn—pigmented light weight taffetas. About 1922 acetate rayon became important not only as a self fiber for lining taffetas, etc. but also for 2x2 and 4x4 crepes, gamzas, matelasses, etc. these were almost invariably acetate warp-rayon filled fabrics. Acetate yarn cannot be crepe twisted as it is too brittle but its value in hand and drape, etc., made it a "natural" for such fabrics. The determining factors in these fabrics were denier and degree of crepe twist and methods of handling in the dyehouse depended on their construction. Then later came a change from crepes to alpacas and romaines with acetate and rayon in both warp and filling. These meant new methods of boil-off, crepe-setting, etc.

The advent of the spun fibers made it possible to construct fabrics with all sorts of combinations of fibers. Important among these have been the all rayon spuns as tropicals, rayon and wool mixtures, rayon and acetate mixtures, etc. The latter may be as yarn mixtures or staple blends. At the present time we are processing such complex combinations as rayon, acetate, wool, cotton and Aralac—all in the same fabric.

From this point on I should like to treat the subject in a slightly more practical manner.

OPERATIONS BY PRE-FORMULATION

Great progress has been made in the last few years by dyeing and finishing plants in carrying out processes by accurate pre-formulation.

All fabrics handled are analyzed for composition and construction. With this information it is possible to

1. Select best method of scouring.
2. Formulate dyeing methods accurately.
3. Formulate finishing methods.

The greatest benefits from this procedure, of course, result in the dyeing. The loss of money and time which resulted from the "hit and miss" methods of years ago were tremendous. Prediction of amounts of dyestuffs and assistants necessary to obtain a certain shade, based on accurate knowledge of composition and characteristics of the fabric to be handled, is very largely responsible for the low cost at which fabrics can be handled today.

Uniformity of quality is also helped materially from the standpoint that if a definite amount of materials must be made to do a certain job, the conditions under which they are used must be kept constant. Ease of obtaining accurate cost anticipation information as well as accurate ultimate cost is the final advantage of operating a piece goods dyehouse by pre-formulation.

To make the method fully comprehensive it must be properly supported by complete control of dyestuff strengths as purchased. Further, complete knowledge of fastness characteristics as well as dyeing characteristics must be known for all dyestuffs available and these properly related to their price.

In this connection it is an interesting fact that in plants using this system anticipated dyestuff consumption over a year's time usually does not vary more then 5% from actual consumption. Another point which very nicely brings out the economy angle is that with this system, 15-20% of dyeings do not require additions to the dye bath beyond formula requirements when a general run of light and medium shades are handled. When navies and blacks are processed it seems to be possible to attain 75 per cent or greater accuracy in handling them by formula.

Benefits derivable from pre-formulation extend to the finishing operations of today where finishes of the resin type are so largely made use of. With the information made available by this system, we can more accurately

predict maximum and minimum resin contents required to accomplish the desired effect.

SCOURING

It is needless to point out the great progress made in surface-active agents during the last decade. They have multiplied at a really appalling rate during the past few years and the rayon operator has a most imposing list at his disposal. It becomes very much of a problem to determine the most effective agent for a given job.

The main general classes—the sulfuric acid esters of the fatty alcohols, the amide types and the alkyl aryl sulfonates—each have properties which fit them for specific uses in every modern scouring department.

In spite of the effectiveness of these newer agents in coping with water-hardness and acidic conditions and their generally good wetting properties, soap is still very much in the picture as a scouring agent. The detergency and emulsifying properties of soap are still hard to beat when cost is taken into consideration. So it will be found that operators will go to great trouble to force soap to do their scouring job. Various phosphates such as hexameta phosphate, tetra pyro phosphate, trisodium phosphate, etc., have been of great help in this respect.

It is possible to make very nice compromises between the newer agents and soap. For instance one can use soap for scouring and then handle any calcium soap which may be carried into the dye bath from the scouring wash by means of a dyeing assistant which has great ability to peptize the calcium soap as well as having high calcium resistance. It is, of course, also possible to use soap and a newer agent in the same bath to surpress some of the weaknesses of soap.

So much for scouring agents. As to equipment, this has kept in stride as well. I should like to point out, however, the open-width, loop scouring machine as being a very noteworthy recent development.

It seems to have become necessary for dyers to do considerably more enzyme desizing in recent years, particularly where spun rayons are concerned. The increasing use of starch as a sizing agent seems to be due to its cheapness and to the fact that more and more cotton mills have gone into these lines and seem to be using types of sizes they are most familiar with.

FINISHING

From a finishing standpoint, lines utilizing urea-formaldehyde resin finishes have been particularly successful. Growth of the development of the application of resins in textile finishing has, of course, been fully anticipated during these last years. The very definite enhancement which these finishes give to fabrics by way of improved grease-resistance, improved resistance to shrinkage, increased bulk, improved hand and permanence has made their increasing use quite obvious.

These urea-formaldehyde finishes as a single class provide an extremely flexible method of finishing. There are three principal types that one can employ—first the low polymer type with creaseproofing and shrinkage control properties, second the high polymer type fiber stabilization and hand control and third the emulsion types for hand control. When some of the newer surface-active softening agents are brought into the picture there results an infinite number of types of finish possible of attainment.

There are, of course, many problems attendant in the application of these resins. Very careful control must be continually maintained in their application. The preparation of the resins calls for continuous and careful check. In the fabrics themselves great care must be taken in many respects. It is important that sufficient care be given in order to insure proper permanence. Residual formaldehyde in the fabric must be continually checked to see that it is before allowable limits. Dyestuffs must be especially selected for subjection to resin application. Odor of fabrics must be regularly followed. It must be made certain that fastness of colors, abrasion resistance and tensile strength are not adversely affected by the application of these resins.

In conclusion, I should like to apologize for the sketchiness of this paper but it is quite difficult to handle a subject of this type in so very short a time in any other fashion. For more detailed treatment on any particular phase of finishing I must again refer you to the many excellent papers presented to you in the past. And further, I should also like to refer you to three groups of individuals who are perhaps the best of all finishers—the dyestuff and auxiliary salesmen, the dyers representatives and the converters.

Reducing Time of VAT DYEING WITH TEXTONE*

A. L. DUBEAU, E. G. FENRICH and G. P. VINCENT

The Mathieson Alkali Works (Inc.)

THOUGH the vat dyes and some of the sulfur dyes are more difficult to apply than many other dyestuffs, they are favored for certain purposes, because they are remarkably fast to light and washing. For this reason, some of them are standard for the production of the olive-drab and khaki poplins and twills that are needed for army uniforms, tents and other military uses; and, as the maximum possible yardage of these fabrics must now be produced, an improvement in the dyeing process that materially speeds it up is of special importance at this time.

This improvement consists in the use of Textone (sodium chlorite) as an oxidizing agent for these dyes.

As is well known, all of the vat dyes and many of the sulfur dyes are insoluble in the media commonly used by dyers, but when reduced in an alkaline solution they form soluble leuco compounds. In practice, they are first applied to the cloth in the insoluble form, then reduced to the soluble form to effect even penetration into the fibers, and finally reoxidized which causes them to revert to their original insoluble state.

All of the leuco compounds will oxidize when exposed to the air; but the process is relatively slow and the coloring is often uneven, so that some sort of an oxidizing agent is generally employed to accelerate and control the oxidation. Hydrogen peroxide, sodium perborate and, especially, sodium dichromate in an acetic acid solution have heretofore been used, but practical experience indicates that Textone is especially suitable for this purpose.

Textone was developed on a commercial basis by the Mathieson Alkali Works about two years ago and is now being widely used for bleaching cotton, rayon and other cellulosic fibers, because it destroys the coloring matter in the fibers without degrading the fibers themselves.

When Textone is used to oxidize vat and sulfur dyes, the end product of the reaction is common salt, which is easily washed out. Fewer washings are needed with the Textone process, and this enables dyers to increase their output by as much as 30 per cent.

In addition, there is no danger of dulling the shade; the goods are more absorbent and have a softer hand; and no health hazards are involved. Even the use of acid may be eliminated, as in many cases Textone is preferably used in an alkaline solution.

The chemical costs of the Textone and the dichromate processes are about the same; but, as the Textone process is more rapid, the cost of operating the jig per unit length of cloth processed is materially reduced.

DETAILS OF THE TEXTONE PROCESS

When an *alkaline solution* of Textone is used as the oxidizing agent, the general procedure in jig operation is as follows:

After the dye on the goods has been reduced to leuco form, the reducing solution is dropped, and the cloth is given from one to four ends in cold water.

The amount of Textone that will be required for complete oxidation of the dye depends upon the weight of the cloth, the amount of dye to be oxidized, and the number of washes given the cloth before oxidation. In practice, it is found that between one-half and one pound of Textone covers most conditions.

In making up the oxidizing solution, sufficient sodium bicarbonate is dissolved in the usual amount of water in the jig to keep the final pH of the bath from exceeding 10.0. The amount required will vary with conditions, but from five to 20 pounds are generally needed. Then one-half of the Textone to be used is added to the bath.

The cloth is given one end in this solution; then the rest of the Textone is added, and the cloth given three more ends. The temperature of the bath should be kept at not less than 140° F. for vat dyes and approximately 130° F. for sulfur dyes.

The oxidizing bath is then dropped, and the cloth is given one or two ends in hot water and is shelled up through cold water.

If the goods are to be soaped, the soap or the detergent can be added to the oxidizing bath after the second end. The temperature is brought up to 180° F., and the cloth is given two ends.

As Textone will not injure the fibers of the goods, the concentration of the solution is not critical, but can be varied over a considerable range without harmful results. The best way to measure out Textone is to make up a stock solution by dissolving the contents of a shipping container, which holds 100 pounds, in 50 gallons of water. As each gallon of the stock solution contains two pounds of Textone, the required amount can be ladled out as needed, thus eliminating the need of weighing out each charge separately.

*Presented at meeting, Philadelphia Section, March 5, 1943.

The bicarbonate is added to the oxidizing bath in the solid form. It, too, can be easily measured out, as a two-quart dipper holds about five pounds. An important function of the bicarbonate is to convert into sodium carbonate any caustic soda left in the cloth from the reducing bath.

Should the goods show a mottled effect due to the use of an insufficient amount of the oxidizing agent, the condition can be corrected by adding more Textone to the oxidizing bath. By contrast, if this trouble develops when dichromate is being used, the dye must be reduced again and then reoxidized.

Under certain circumstances, it may be desirable to use an *acid oxidizing solution* instead of an alkaline one. In this case, the procedure is the same as that already outlined, except that a solution of approximately the following proportions is used:

Water	50 gal.
Textone	2 lbs.
Acetic Acid—28%	10 lbs.

About three ounces of tetrasodium pyrophosphate or a similar detergent material may also be added to advantage.

SPECIFIC APPLICATIONS

Alkaline Solutions

Heavy Twill, 2 Yards per Pound

Fabric from reducing bath is given four ends through cold water.

Then, one end in the following solution:

Textone	¼ lb.
Sodium Bicarbonate	5 lbs.
Water	50 gal.
Bath temperature	140° F.

Another one-quarter pound of Textone is then added to the bath, and fabric given three more ends.

Then, one or two ends through hot water at 180° F.

Four ends through soap and soda-ash solution.

Three ends through hot water; shell up through cold water.

Challis Type Spun Rayon, 10 Yards Per Pound

Fabric impregnated with reduced Indanthrene vat dye is given two ends through cold water.

Then, one end in bath containing:

Textone	⅛ lb.
Sodium Bicarbonate	5 lbs.
Water	25 gal.
Bath temperature, 140° F. pH	8.3 to 8.45

Then, another one-eighth pound of Textone is added to the bath, and fabric given three more ends.

Then, two ends through hot water; shell up through cold water.

Twill, 2 Yards per Pound

Fabric impregnated with reduced sulfur dye is given four ends in cold water.

Then, one end in following bath:

Textone	¼ lb.
Sodium Bicarbonate	5 lbs.
Water	50 gal.
Bath temperature	130° F.

Another one-quarter pound Textone is then added to the bath, and fabric given three more ends.

Then, four ends through hot water, and pass to soaper.

Acid Solutions

Twill, 1.69 Yards per Pound

Fabric impregnated with reduced vat dye is passed without washing, and given three ends in the following bath:

Textone	1 lb.
Acetic Acid—28%	1½ gal.
Water	50 gal.
Bath temperature	140° F.

Then, wash, and pass to soaper.

APPLICATION BLANKS

for Individual
and Corporate

MEMBERSHIP

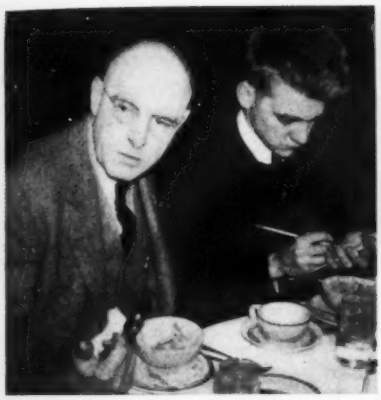
may be obtained from
the Secretary

Dr. H. C. Chapin, Lowell Textile Institute, Lowell, Mass.

MEMBERS AND GUESTS ATTENDING PIEDMONT SECTION MEETING

Some of those in attendance at the meeting on March 6th in Greenville, S. C. Report of the meeting appeared in the March 29th issue. Photos by Robert W. Philip.

Thomas R. Smith, president of the A.A.T.C.C.; Lieut. Col. Thomas D. Lewis, Jeffersonville Quartermaster Depot, who discussed his work at the depot; C. Norris Rabold, chairman of the Piedmont Section; Elmer C. Bertolet, Jeffersonville Quartermaster Depot, who spoke on "The Finishing of Army Ducks with Particular Reference to Mildew Proofing"; P. J. Wood, a past president of the A.A.T.C.C.; and Henry B. Dixon, treasurer of the Piedmont Section.



ABOVE—Byrd Miller; R. W. Arrington; C. B. Hayes; C. B. Hayes, Jr.; R. W. Jacoby; Samuel L. Hayes; and George Shoemaker.

LEFT—Arthur R. Thompson, Jr., publicity chairman of the Piedmont Section and a newspaper reporter.

ABOVE—Ed. Briggs; T. J. Nuckolls; Homer Whelchel; and H. Gillespie Smith.

BELOW—Allyn J. Morse; F. H. Rose, Jr.; Curt Mueller; and George E. Missbach.

ABOVE—(Facing camera)—Capt. Kelly Traynham; Hugh Puckett; Laurie E. Whittelsey; R. Hobart Souther; and John C. Cook.

BELOW—R. H. Smith; W. H. Bertolet; Hyman H. Field; and Raphael E. Rupp.

• CALENDAR •
OF COMING EVENTS

Meeting, New York Section, Downtown Athletic Club, New York City, April 16, 1943. Speaker: Lt. Col. Frank M. Steadman, Philadelphia Quartermaster Depot, will discuss research and development in the Q. M. C.

General Business Meeting (in conjunction with New York Section meeting) April 16, 1943, New York City.

Council and Research Committee Meetings, April 17, 1943, Engineering Society Building, 29 West 39th Street, New York City.

Meeting, Southeastern Section, Atlanta Athletic Club, Atlanta, Ga., April 17, 1943.

Meeting, Philadelphia Section, April 30, 1943.

Meeting, Rhode Island Section, Providence Engineering Society, Providence, R. I., April 30, 1943.

Spring Meeting, Mid-West Section, Hotel Schroeder, Milwaukee, Wis., May 1, 1943.

Meeting, Piedmont Section, Greensboro, N. C., June 5, 1943.

NOTE: The date of the Northern New England Section meeting originally scheduled for April 16th was changed to April 9th.

TRADE NOTES • NEW PRODUCTS

• 1943 FALL WOOLEN AND RAYON COLORS

In keeping with its firmly established wartime policy, The Textile Color Card Association's 1943 Fall Woolen and Rayon Colors, just issued to members in confidential swatch form, have been chosen not only for their fashion value, but with the aim of conserving vital dyestuffs. In planning its color conservation program for fall, the Association has been guided as usual by its official Dyestuff Advisory Committee. Moreover, this season it has given its fullest cooperation to the Silk and Rayon Printers and Dyers Association of America, as well as to the Textile Distributors Institute, in a joint movement to promote colors which will conserve dyestuffs and conform to dyeing restrictions, as determined by the War Production Board's Conservation Order M-103, as Amended January 30, 1943.

Whereas, last season, the Association's Woolen and Rayon Collections featured different shades with few exceptions, this fall, as a further effort toward color conservation, it was explained by Margaret Hayden Rorke, Managing Director, all of the shades in the rayon group, with eight exceptions, are prototypes of the woolen colors and carry the same names, thus reducing considerably the total number of colors available for fall merchandising.

With reference to the woolen group, the notation is made that every color in the collection is adaptable to all woolens and worsteds, wool and re-used wool, wool and re-processed wool, woolen and rayon mixtures and woolen and cotton mixtures. As regards the rayon collection, Mrs. Rorke explained that all of the colors have been selected so that they are of a character that will offer a minimum of difficulty when they are reproduced on any fiber or mixtures of fibers, with consideration of limitations and restrictions of dyestuffs.

• JOINS NORTH STAR WOOLEN

Charles L. Hayward, recently sales representative of the TelAutograph Corporation, has joined the North Star Woolen Mill Company of Minneapolis as a research engineer. Mr. Hayward, who holds an electrical engineering degree from Columbia University where he specialized in electrochemistry, will devote himself to North Star's rapidly-expanding research program.

• CAMOUFLAGE FINISHES

A new fire, water and weather resistant finish for cotton camouflage nets used in all climates has been announced by the Fine Chemicals Division of E. I. du Pont de Nemours & Company.

INVISIBLE CHEMICAL "RAINCOAT"

The new invisible "raincoat" which can be formed on cloth, paper and many other materials by exposing them to chemical vapors is demonstrated here by Dr. Francis J. Norton of the General Electric Research Laboratory by holding treated and untreated filter papers under a water faucet. On the untreated paper, the water is absorbed; on the treated, it rolls off the surface. The process was discovered by Dr. Winton I. Patnode, G-E research chemist, and was described in the March 29th issue of the Reporter.

It is stated that the Army Engineers have tested the new chemical finish, which is flexible in sub-zero weather, but which will not become sticky or support combustion at high temperatures. It is made in sand and olive drab shades, which colors are said to be very fast to light and exposure.

This finish is said to eliminate the objectionable properties and hazards of solvent type agents. An aqueous emulsion, it can be applied by padding and drying with moderate heat treatment.

Although developed by Du Pont especially for the Army, such peacetime applications as the treatment of tobacco cloth are indicated when the material is available for civilian uses. The new product is officially called Camouflage Sand No. 3 Finish and Camouflage Olive No. 9 Finish.

• SYNTHETIC TEXTILE FIBERS

A reprint entitled "Progress in New Synthetic Textile Fibers" is available from the author, Herbert R. Mauersberger, technical editor of *Rayon Textile Monthly*, 303 5th Ave., New York City. The article represents a paper presented at the Papers Session of the American Society for Testing Materials on March 11th at the Park Central Hotel, New York City. The information contained in this paper supplements that given in a paper presented in October, 1940. Among the items covered are: thermoplastic resins, Vinyon E, Aralac, Soylon, peanut protein fiber, and plastic coated textile yarns. A new classification of man-made fibers is also presented.

• HOSIERY CONSERVATION PROGRAM

The War Production Board recently imposed a broad conservation program on men's, women's and children's hosiery with the triple objective of eliminating poorer quality stockings, effecting savings of cotton, rayon, and wool yarns, and facilitating maximum production of all types of hosiery through more efficient utilization of existing equipment. The order (L-274) is effective May 15.

The order (1) lists specific manufacturing practices which must be followed in production of all types of hosiery to assure elimination of the poorest-wearing types; and (2) limits colors and patterns in which hosiery may be made.

Officials of the Textile, Clothing and Leather Division said that the action—the first WPB has taken affecting rayon hosiery production—will insure the manufacture of better quality full-fashioned rayon hosiery for women. (Rayon hosiery constitutes practically all full-fashioned hosiery made today.)

Specified constructions listed in an appended schedule to the order permit all weights and degrees of sheerness that now exist in women's rayon hosiery. A similar schedule lists constructions for seamless, circular-knit rayon and cotton stockings.

The specifications laid down by the order closely parallel construction provisions listed in Maximum Price Regulation 339, issued March 8 by the Office of Price Administration.

It was estimated that the order will result in savings of approximately 14,800,000 (fourteen million, eight hundred thousand) pounds annually of cotton, rayon and wool yarns. Most of the savings will be realized from conservation measures ordered for men's and children's socks.

It is anticipated that slightly larger amounts of yarns than heretofore will be required in manufacture of women's hosiery, but officials emphasized that this will result in long-run conservation since it is expected that stockings made according to provisions of the order will generally be more durable and wear longer than those previously manufactured.

Color restrictions are as follows: *Women's Hosiery*—Each manufacturer is limited to 7 basic colors for each 6 months period, and no more than 5 of these 7 colors can be used in any one style of hosiery. In effect, this does not reflect any change in the present situation, since most women's hosiery manufacturers have already voluntarily limited their range of colors to this number or less. *Men's Hosiery*— Colors are restricted to 7 basic colors, no more than 5 of which may be used in any given style. In addition, white and 3 "war service" colors (olive drab, khaki and a special color for officers' wear) may be used. There are no limitations on the use of various colored yarns for decorative purposes, particularly for clocks on men's socks. *Misses', Children's and Infants' Hosiery*— Colors are limited to 7 basic colors for each manufacturer in each 6 months period compared to a range of over 30 colors in the past. No more than 6 colors are permitted for any one style of standard type hose and no more than 4 for any one style of novelty hose.

• APPOINTED MANAGER

Karl M. Currier has been appointed manager of the American Viscose Corporation's War procurement Department, and William M. Harvey has been appointed assistant manager, it was announced recently. Mr. Currier previously was assistant manager of the company's Sales Development Department at Marcus Hook, Pa., and Mr. Harvey has been a member of the staff of the War Procurement Department.

The primary function of the War Procurement Department is to ensure full utilization of the company's auxiliary facilities and equipment for the prosecution of the war effort. This is accomplished by manufacturing military material with equipment that is not in use 100 per cent of the time on production of rayon. The department was organized shortly after our entry into the war, when it became apparent that all available machine shop facilities and other similar installations would be needed for the manufacture of arms and other equipment required by our rapidly expanding military forces.

• NEW NATIONAL STARCH PLANT

Henry F. Schricker, governor of Indiana, on March 19 broke the seal of the first carload of corn to enter the conveyors of the newly reconstructed Indianapolis plant of National Starch Products Inc., thereby starting production on an additional 100,000,000 lbs. of corn starch annually. Operations will be on a continuous 24 hour a day, seven days a week basis.

This starch will be used for food purposes, for domestic and lend-lease consumption; for the manufacture of textiles, paper, and other industrial commodities; and for the processing of the adhesives, dextrines, and other starch derivatives produced by National's Adhesives Division for the packaging, wrapping, and sealing of army, navy, and lend-lease materials, as well as those for essential civilian subsistence.

Governor Schricker was one of a number of prominent officials who attended the informal opening ceremonies. Others included Robert H. Tyndall, mayor of Indianapolis; C. D. Alexander, of the Indianapolis chamber of commerce, who acted as master of ceremonies; high-ranking army and navy officers; and representatives of various federal agencies, manufacturing, educational, agricultural, and civic groups. Many executives and employees of National Starch Products Inc. were also present, headed by Frank K. Greenwall, president, Arthur D. Fuller, executive vice-president, and Chester A. Gage, vice-president in charge of sales.

• NEW OFFICE, PAUL A. DUNKEL & CO.

Paul A. Dunkel & Co., Inc., have announced the removal of their office to 1 Wall Street, New York City. The 'phone numbers are HAnover 2-3750 and 3751.

• APPOINTED ASST. MGR., STEIN, HALL BRANCH

W. M. Kline, Jr. was recently appointed Assistant Manager of the Charlotte Southern Branch of Stein, Hall & Co., Inc., manufacturers and distributors of textile starches, gums and dextrines.

Mr. Kline has been associated with Stein-Hall for fourteen years, ever since his graduation from Clemson College, Clemson, S. C., where he specialized in textile chemistry. After a year in the Stein-Hall textile laboratory in Charlotte, he became a traveling representative for the Company's textile sizing, finishing and printing materials. He is known throughout the Southern textile industry, especially in the South Carolina territory, which he covered until his appointment as assistant to Ira L. Griffin, manager of the Charlotte branch.

Mr. Kline is moving to Charlotte, where his new duties as assistant manager will include coverage of the North Carolina and Virginia territory formerly covered by Thomas C. Davis, who died recently. Mr. Kline is a member of the Southern Textile Association and the American Association of Textile Chemists and Colorists and has served on various committees of both organizations.

• NEW GLYCOL-ETHER

Ethylbutyl "Cellosolve," a new glycol-ether recently developed by Carbide and Carbon Chemicals Corporation, is a colorless liquid that resembles butyl "Cellosolve" in many of its properties, but two additional carbon atoms give it greater hydrocarbon solubility and increase its boiling point to 186°C. Unlike butyl "Cellosolve," ethylbutyl "Cellosolve" is almost insoluble in water (0.45 per cent at 20°C.); the solubility of water in the solvent is 8.2 per cent at 20°C.

It is stated that, when used in synthetic resin lacquers, this new compound should help to produce higher gloss, a reduction of orange peel, and greater toughness of film. Ethylbutyl "Cellosolve" may also be used in hydraulic fluids, as a mutual solvent, and as a plasticizer intermediate.

Further information concerning this chemical is available from Carbide and Carbon Chemicals Corporation, 30 East 42nd Street, New York, N. Y.

• CALCO BULLETINS

The package dyeing of Olive Drab No. 9 for use in knitted underwear fabric is covered in Calco Technical Bulletin No. 685.

Formulas for both Groups A and B dyes are included, and a swatch of knitted fabric has been included for shade.

Bulletin No. 681, "Piece Dyeing of Fabrics for Work Clothing" covers the dyeing and finishing with sulfur and vat colors of twills, drills, jeans, and gabardines in ten different shades. The formula for each shade is given along with a swatch of that particular color which was produced under mill conditions.

While the bulletin has been written primarily for the use of dyers and finishers specializing on Government procurements, the wide range of shades demonstrated therein will prove interesting for civilian work as well.

Bulletin No. 682 covers the Dyeing and Finishing of Mosquito Netting for use in Army camouflage work.

This bulletin is a comprehensive treatise on procedures for handling of Bobbinet, Tricot and Nottingham nettings, under Quartermaster Corps Specification PQD No. 82-No. 669-43, Philadelphia Neg. 190-43.

In addition to methods and formulae for dyeing, it covers at some length the application of Aerotex finishing resins based on mills runs.

Copies of these bulletins may be obtained by writing to the Advertising Department, Calco Chemical Division, American Cyanamid Company, Bound Brook, New Jersey.

• COMMISSIONED A LIEUTENANT

Thomas R. O'Malley, in charge of patents for the American Viscose Corporation, has been commissioned as a Lieutenant (j.g.) in the United States Naval Reserve and has reported for duty at Jacksonville, Fla., where he is attending the Indoctrination School of the Naval Air Intelligence Bureau.

A MICROSCOPICAL STUDY OF DYED WOOL

G. L. ROYER and CHARLES MARESH

Research Department, Calco Chemical Division, American Cyanamid Company

IN our early microscopical studies of the dyeing of wool, it was noticed that concentrations of color appeared as "specks" in many of the cross-sections. Fig. 10b in a previously published paper by Royer and Millson[1] shows these "specks" but at that time their presence was not discussed. The presence of solid dye has been observed by others. Speakman and Smith[2] have noticed a "pitted appearance suggesting that the dye had accumulated" in the mohair fiber when dyed with Solway Blue SEN. Astbury and Dawson[3] have reported that there is X-ray evidence of crystalline dye in wool fibers. In this paper these "specks" will be more completely described and their presence relative to dyeing will be discussed.

The work of McMurtrie[4] published in 1886 gives an excellent microscopical study of wool structure. W. von Bergen[5] also has emphasized many points relative to fiber structure. Hock, Ramsay and Harris[6] recently published an article on the microscopical structure of wool in which they confirm the work of McMurtrie in regard to the cell structural composition of the wool fiber. Figures 1a and b are two drawings taken from McMurtrie's work which show this cellular nature. From this work it appears that the "gel-like" wool fiber is composed of elongated cells tightly packed together. Cross-sectional and longitudinal examinations of undyed or lightly dyed wool, figures 2 and 4, give no marked indication of this structure at the interstices of these cells. However, disintegration with strong sulfuric acid to the point of disruption of the fiber, figure 5, produces longitudinal break down, supporting the belief that there is structure at the interstices of these cells. During dyeing, swelling takes place and in all probability these cells are somewhat forced apart to make "voids" at these interstices. In our opinion it is the deposition of solid dyestuff in these openings that causes the "specks."

These "specks" are often found in dyeings of chromed colors, for example, Calcochrome Blue Black Conc., C. I. 202, dyed top chrome, see figure 7; and in many of the fast-to-washing dyeings such as those made with Sulfon Cyanine dyes, for example, Calcocid Navy Blue 3R, C.I. 289, see figure 8. The "specks" in the latter being the largest we have observed. They are also found when high concentration dyeings of 30 per cent Calcocid Orange Y, C.I. 151, are made, see figure 3, but low concentration dyeings of 2 per cent of this same color, see figure 2, do

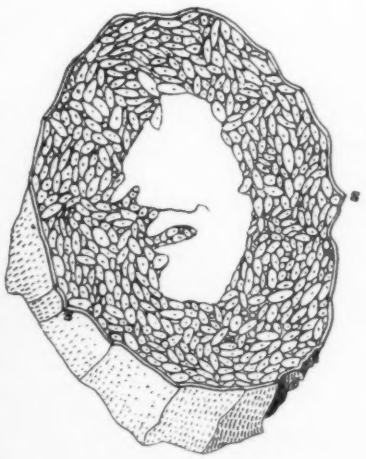


Fig. 1a

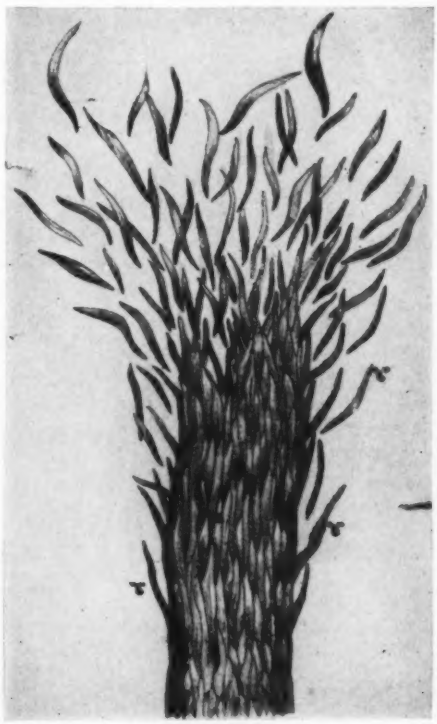


Fig. 1b

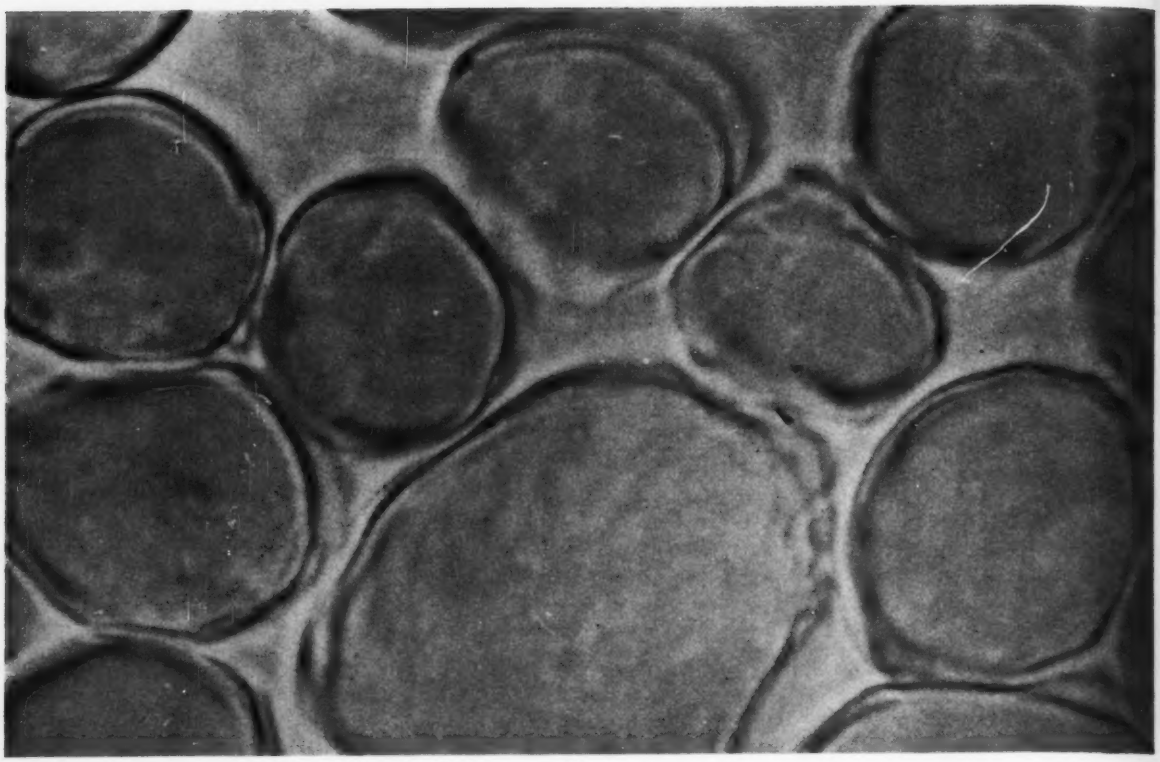


FIG. 2 2000X

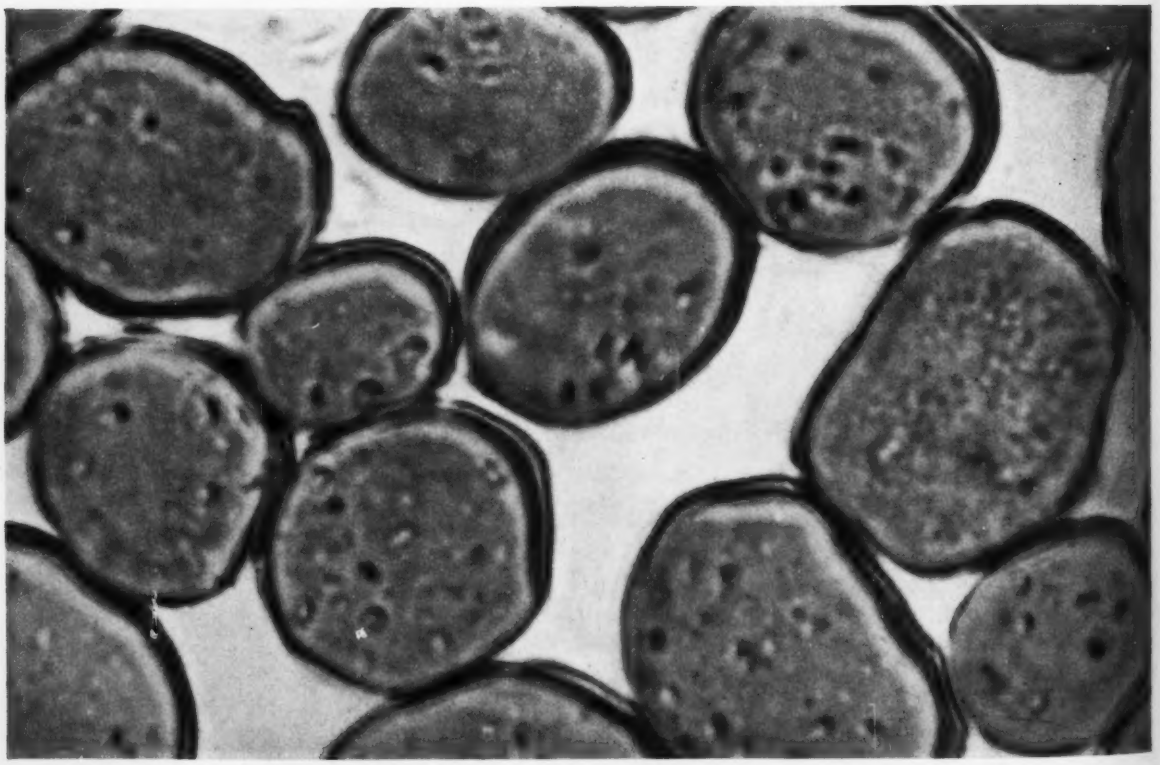


FIG. 3 2000X

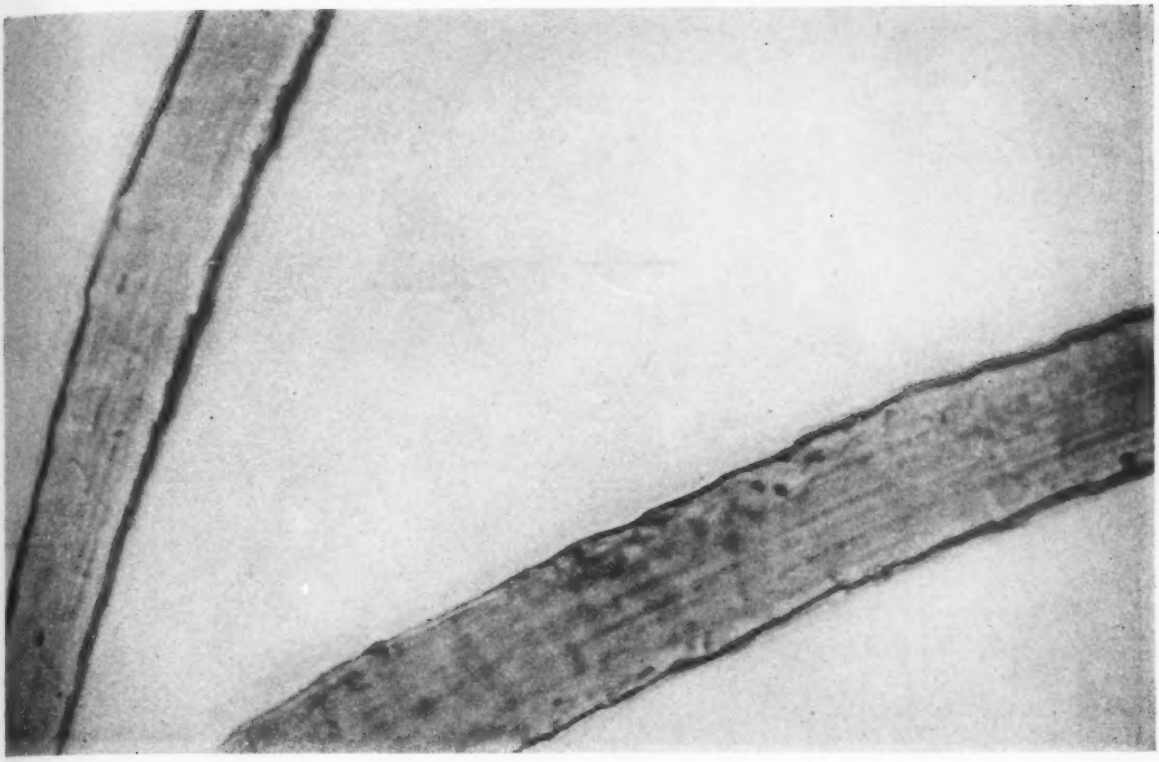


FIG. 4 1000X

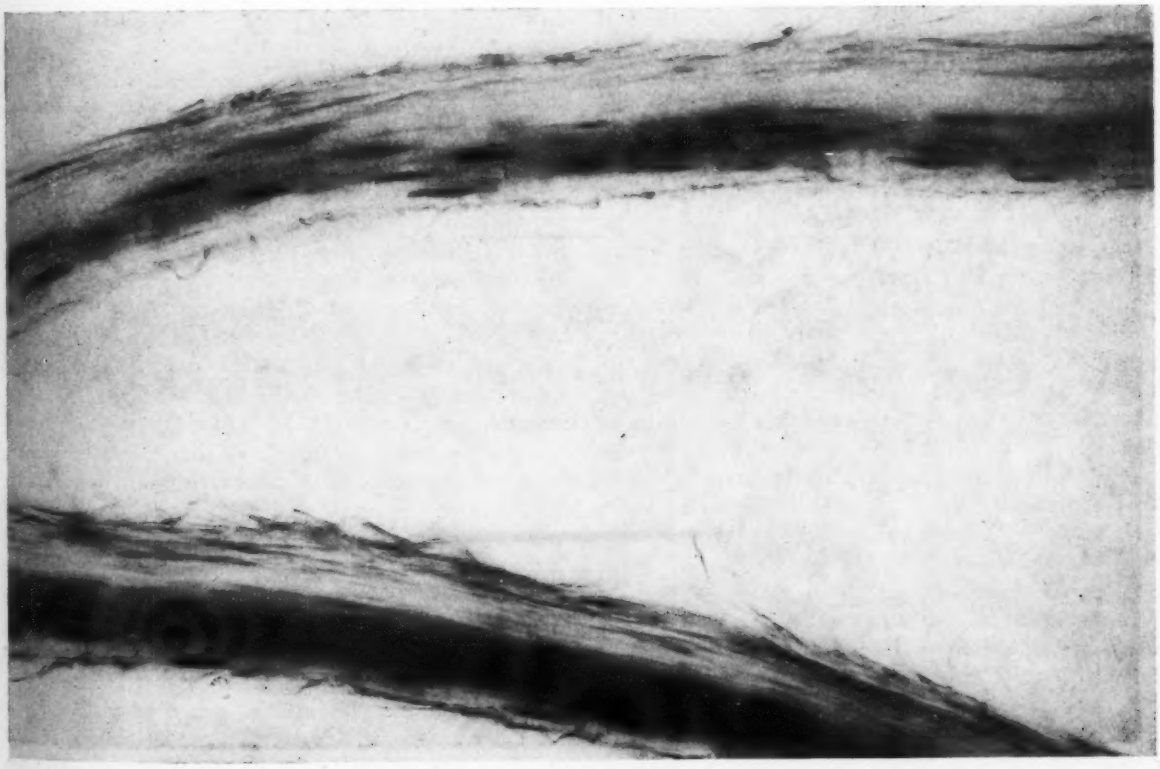


FIG. 5 1000X

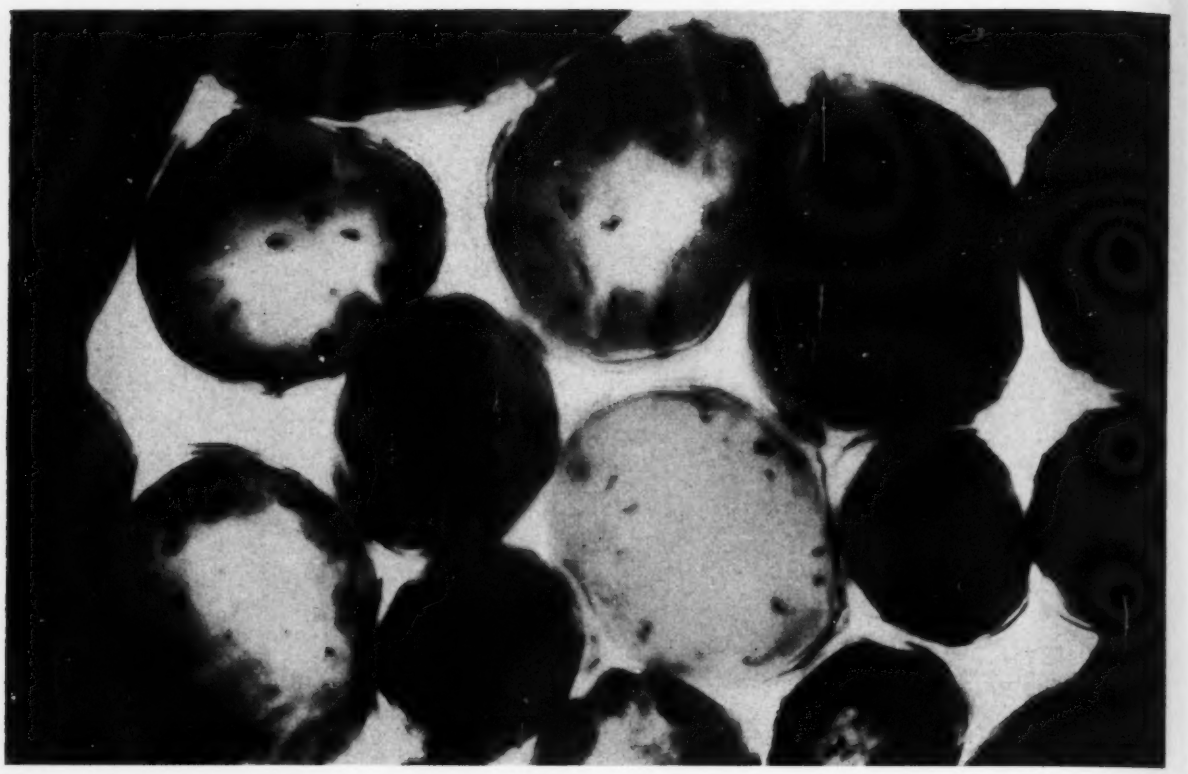


FIG. 6 2000X

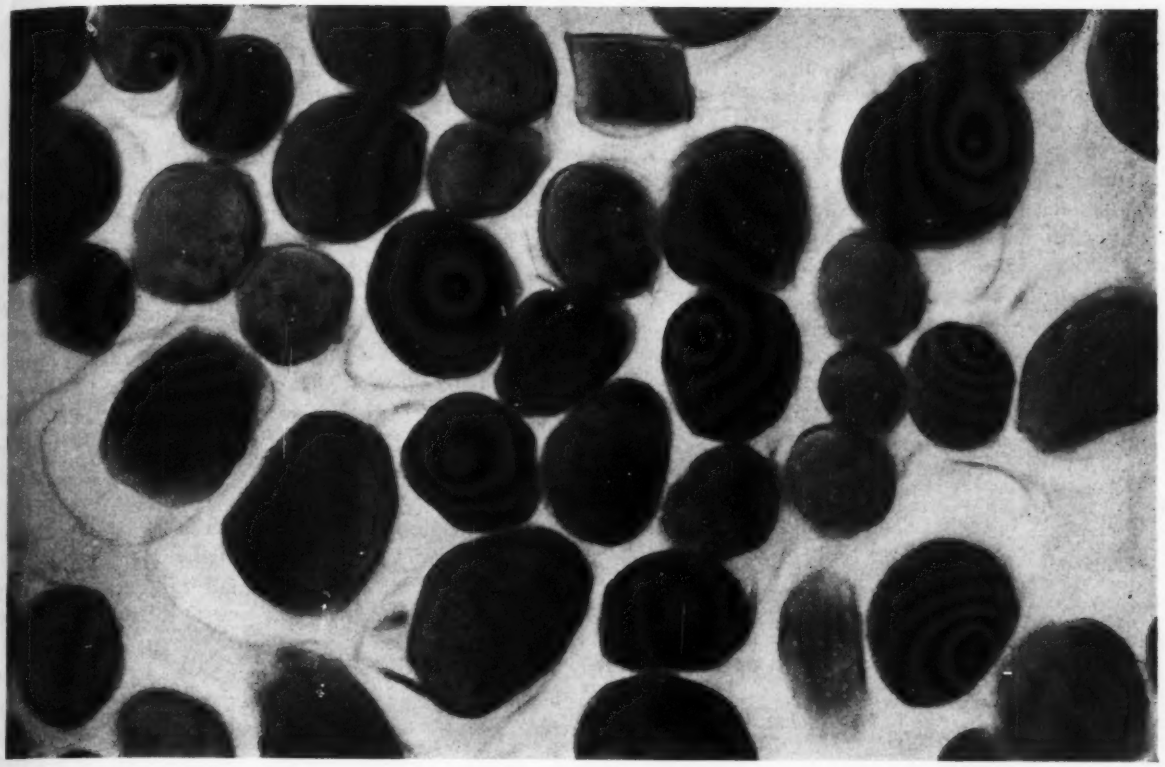
not show the "specks." It is possible that the presence and the size of these "specks" may be related to the solubility of the dye.

A dyeing of a chromed color (Calcochrome Fast Red ECB, C.I. 652) is shown in cross-section at high magnification in figure 6. This is the same fiber shown in figure 4 in longitudinal view. In the longitudinal view, there is little indication of the color "specks." However, when concentrated sulfuric acid is allowed to diffuse into this fiber, the fiber begins to swell and disintegrate. The chromed color being soluble in the acid begins to bleed or flow along the interstices and this is shown in figure 5. Observations made with a polarizing microscope show no anisotropic material and from this it is concluded that the concentrated color of the "specks" is not present as large single crystals but as fine precipitated dyestuff. Observations with sections mounted in liquids of refractive indices approaching those of wool indicate that these "specks" may be "voids"; the color being deposited only on the walls of these "voids" which are formed at the interstices of the cells.

A conception of the mechanism of the formation of these "specks" or concentrations of color can be briefly described as follows:

The dyestuff solution diffuses through the wool fiber and as this happens the wool fiber swells and the cells of the wool partially separate. The greater the swelling, the greater the stress applied between the cells; thus causing larger "voids" to occur. The dyestuff solution then fills up these "voids" and becomes quite concentrated because of the surface tension forces in capillaries[1]. Acids and salts added during the dyeing also diffuse into the "voids" and may cause precipitation of the color within the "voids" during the dyeing operation. The fibers on being removed from the dye bath contain these dye solutions trapped in the "voids." The fiber is then dried during which time the water in the "voids" diffuses out leaving the solid dye on the walls of the "voids." In the case of chromed and other insoluble dyestuffs, the dye is converted into an insoluble form, and solution of the dye on subsequent wetting would be difficult due to the insolubility of the product. These "specks" in the fiber obviously appear larger if more dye is deposited within them and also appear larger if the "voids" are larger in size. Since the dimensions of these "voids" in the fiber are so close to the limitations of vision of the optical microscope, it is difficult to look further into the exact nature of the deposit and the size of the "voids." It may be possible that further work with the electron microscope will reveal much, relative to this type of deposition of color within wool fibers.

The theoretical significance of these observations relative to dyeing is not the chief intent of this paper. It is believed, however, that the phenomenon presented plays an important part especially in certain types of dyeing. It may be an explanation of the excess dye taken up, above the theoretical expectation as shown by Steinhardt, Fugitt



M.C. 7 1000X

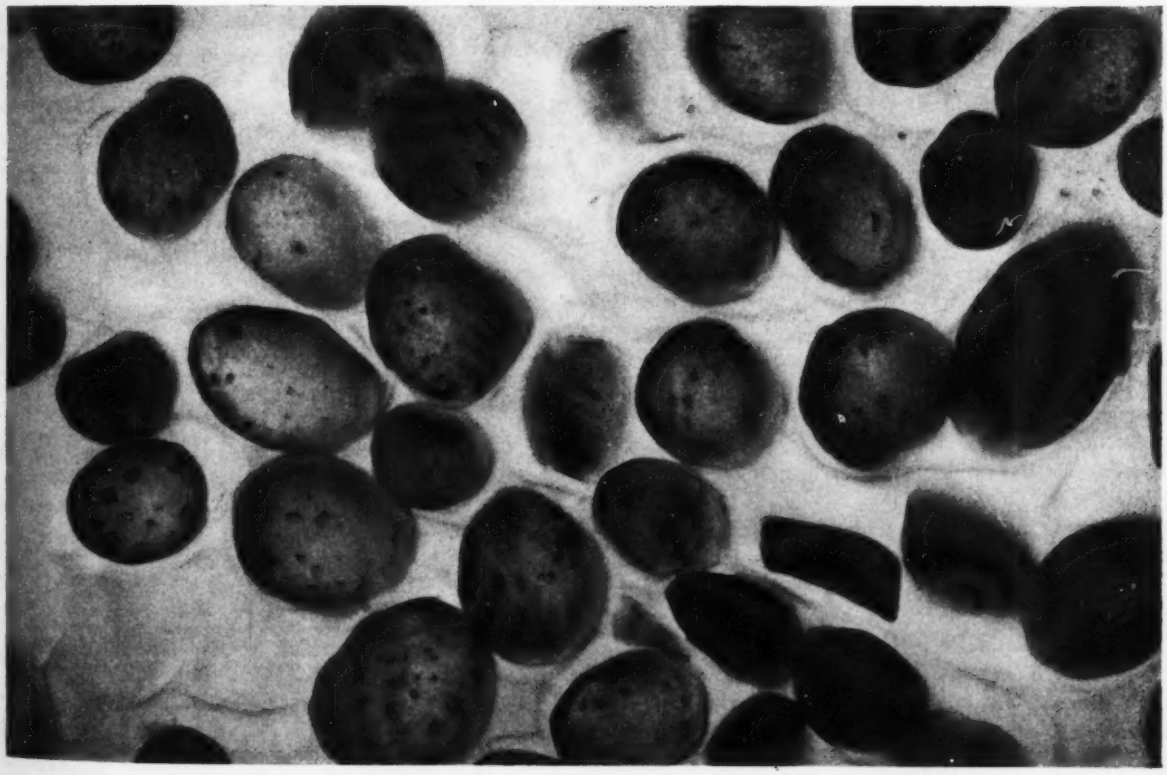


FIG. 8 1000X

and Harris[8]. It may also partially explain the dyeing of some of the fast-to-washing types of colors. The dyeing of indigo and other vat dyes on wool indicates that vats too form concentrated color areas of insoluble dye in the "voids." While these "specks" may not account for a large percentage of the color in the fiber, it appears that they are of importance in dyeing and the fastness of the dyeings obtained. There is some suggestion from work in progress that the size and frequency of these "voids" may be an indication of the lowering in tensile strength when wool is treated or dyed by certain methods.

The authors wish to express their appreciation of help and suggestions received from Mrs. A. M. Harding and Mr. H. E. Millson, and also to Dr. R. H. Kienle under whose supervision this work was carried out.

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• TECHNICAL NOTES • From Foreign Sources

The Scope of Rayolanda X as a Supplementary Fiber

H. A. Thomas—J. Soc. Dyers & Col., 58-197, *Oct.*, 1942.—The new fiber, Rayolanda X, is not claimed to be a substitute for wool or for any other fiber. On the other hand, mixtures of Rayolanda X with wool or with Fibro possess novel textile properties which render these blends of much commercial value. A supplementary fiber giving novel effects when mixed with a natural fiber will assist the sales of the natural fiber, but new synthetic fibers to be of value must possess distinctive properties not possessed by the natural fibers. Rayolanda X is of value because it possessses dyeing properties and a "handle" different from those of any other fiber.

Rayolanda X is a basified viscose Fibro. Hundreds of patents cover basification processes, but only a few fibers of this type have been marketed, and of these only two have withstood the test of commercial usage. The two successful fibers are Rayolanda X of Courtaulds Ltd. and Vistralan of the I. G. Farbenindustrie. The latter is produced by incorporating a basic compound (thought to be an ethylenemine polymer) in the viscose spinning dope, whereas chemical modification of the viscose Fibro is effected by the Rayolanda X process. Examination under the microscope of Vistralan dyed with acid dyes shows colored resin particles dispersed in an undyed viscose rayon matrix, whereas the Rayolanda X fiber substance is dyed.

The advantages which Rayolanda X confers when mixed with Fibro wool and wool-Fibro mixtures may be briefly stated as follows: Mixtures of Rayolanda X and Fibro are warmer in handle, more "whiskery" and fuller in appearance than the corresponding 100 per cent Fibro yarn or fabric.

Rayolanda X has affinity both for wool and cotton dyes. Dyed with direct dyes its washing fastness and wet fastness generally are superior to Fibro. A further advantage is in its lower water inhibition with a corresponding increased rate of drying. Mixed with wool, the denier regularity of Rayolanda X is of value in spinning the blend, and a yarn of higher wet and dry tensile strength is produced than an all-wool yarn of the same count and twist. The blend is also said to respond even better than 100 per cent wool to the various anti-shrink processes. A satisfactory non-felting yarn or fabric is produced by its incorporation with an anti-shrink treated wool top, and in dyeing Rayolanda X-wool blends it is possible to secure contrasting two color, color and white or tone-in-tone effects through the use of simple one-bath dyeing processes.

Most of the advantages indicated for such two-fiber blends also apply to ternary mixtures of fibers containing Rayolanda X. The possibilities of mixed color effects here should be stressed. Heather mixtures can be produced by a one-bath dyeing process, owing to the affinity of Rayolanda X for both wool and cotton dyes.

The technique of dyeing Rayolanda X blends is discussed in some detail. It has been found that in combination with Fibro, when employing all classes of cotton dyes, the higher the dyeing temperature and the lower the salt concentration, the heavier the shade on the Rayolanda X relative to that on the Fibro. Tone-in-tone effects, with a heavier shade on either fiber, or solid shades, can therefore be produced by means of temperature control or salt control. Direct dyes are superior in washing fastness on Rayolanda X compared with Fibro or cotton. Solid shades may be dyed on Rayolanda X-wool blends without exceeding the temperature of 80° C. if level dyeing acid dyes are employed.

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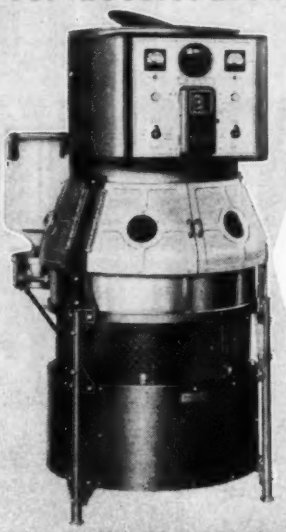

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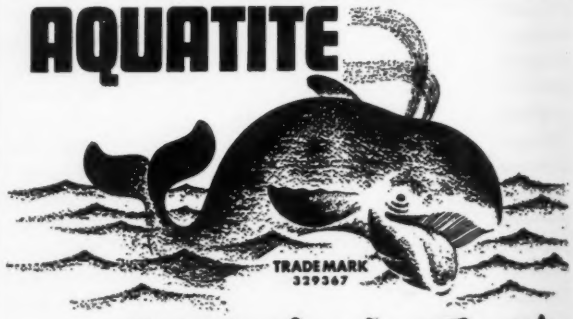

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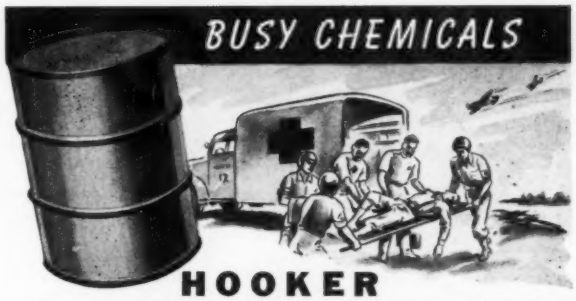

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Aluminum Chloride, Anhydrous, continues to serve the dye industry in its role of catalyst, although the war has increased the requirements for several other essential uses. The production of high octane gasoline, synthetic rubber and pharmaceuticals are examples of the new demands. At Hooker, war needs have first call but we still value our dye-producing customers and will do all we can for them in compliance with government regulations. Effective February 20, 1943, the use of Aluminum Chloride, Anhydrous, is controlled by General Preference Order M-287 of the WPB.

HOOKER produces many other chemicals for the dye industry. See Chemical Engineering Catalog or write for newest list DS.

HOOKER SPECIFICATIONS:
$Al Cl_3$

Description: Grayish white solid
Size: Coarse: Caught on No4 screen, largest lump 1-in max.
Fine: Practically all passes No20 screen.
Purity:
Aluminum Chloride.....99% minimum
Iron .....0.5% maximum
Heat of Solution 550 s.c/gram, minimum
Shipped in 55-gal. drums containing 500 lbs. and 5-gal. pails containing 50 lbs.

HOOKER ELECTROCHEMICAL COMPANY
Niagara Falls, N. Y., Tacoma, Wash.,
New York, N. Y., Wilmington, Calif.

HOOKER CHEMICALS

3649-A

NYANZA
ANILINE & ALIZARINE COLORS
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Inquiries about Technical Problems Invited

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In this vital work Burkart-Schier is playing an active part. For Burkart-Schier chemists and textile chemicals are working right along with America's textile plants, helping to process all sorts of military fabrics, giving fabrics needed characteristics, making fabrics fit to fight!

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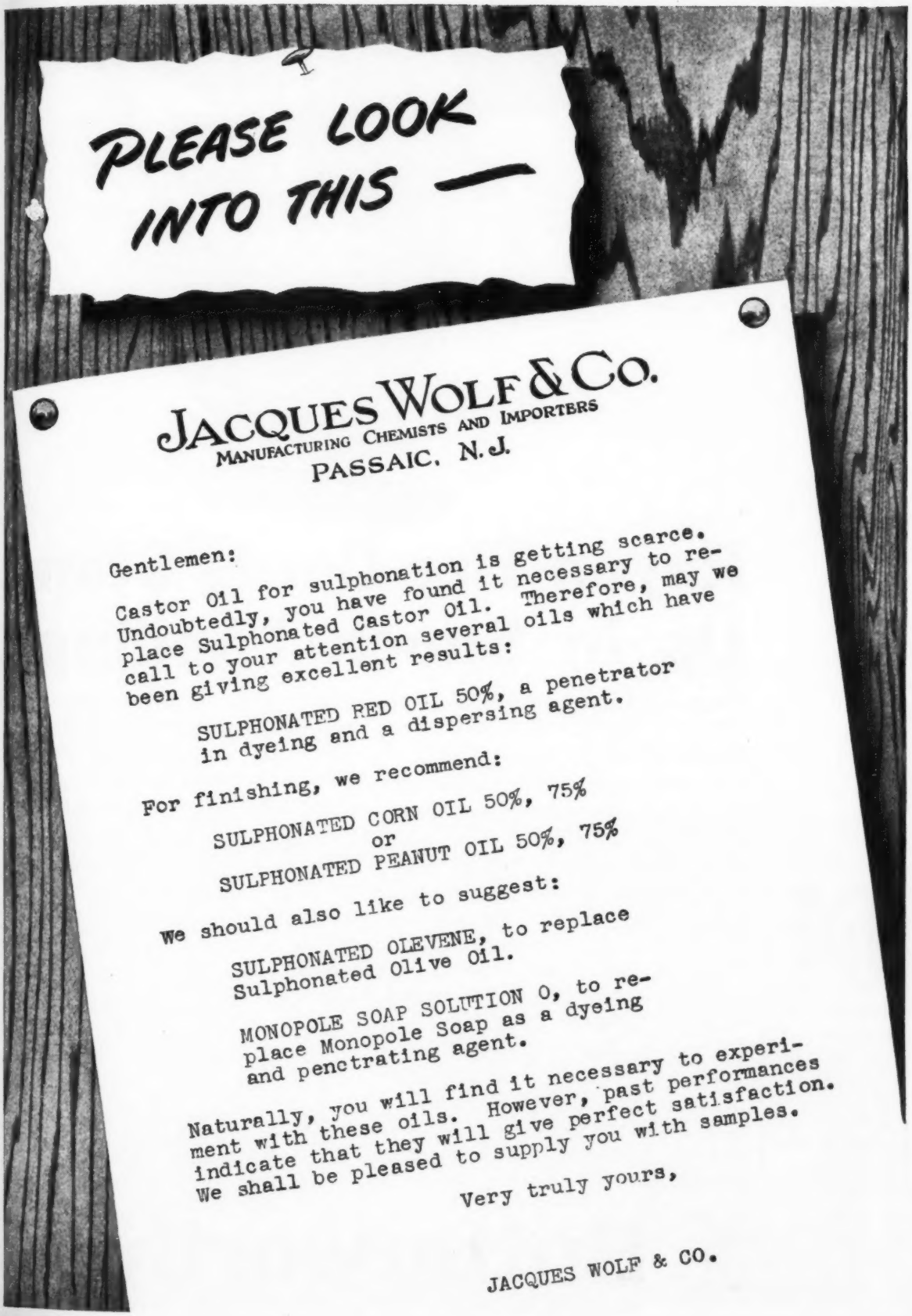
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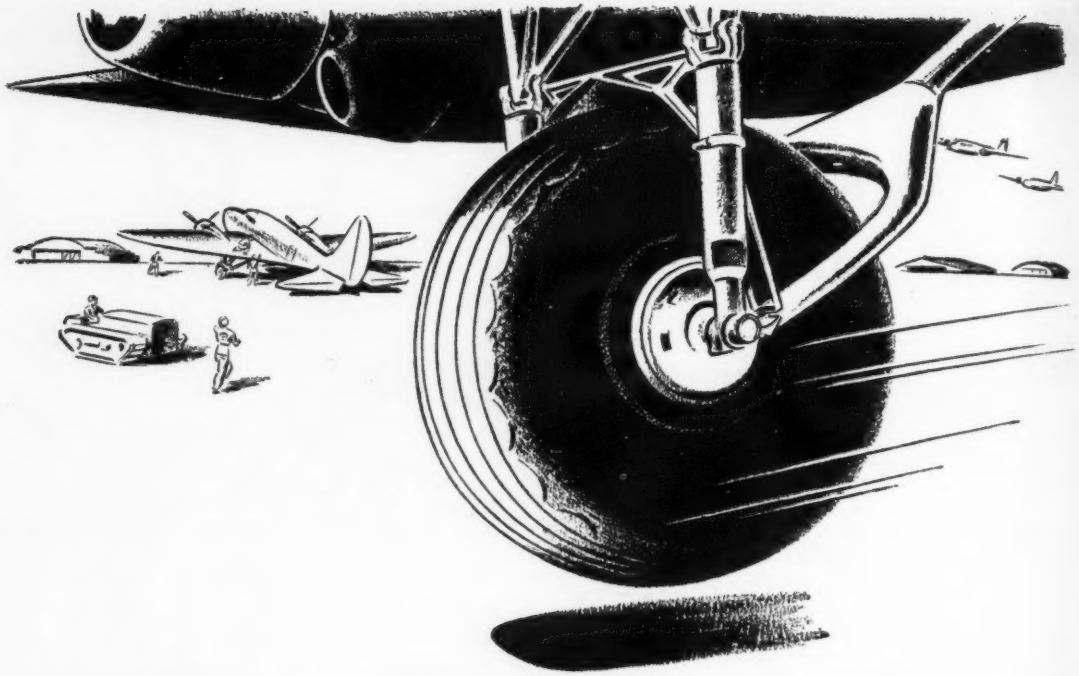

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U. S. Army Signal Corps Photo

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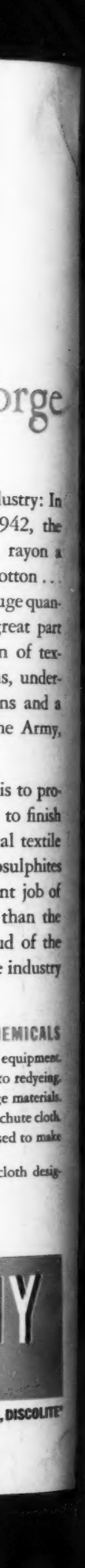
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